

## SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: WILLIAM G. VAUGHN SR. Examiner #: 02100 Date: 8/20/03  
 Art Unit: 1754 Phone Number 305-7792 Serial Number: 09482108  
 Mail Box and Bldg/Room Location: CP3-9A15 Results Format Preferred (circle): PAPER DISK E-MAIL

CP3-9A15

If more than one search is submitted, please prioritize searches in order of need.

\*\*\*\*\*

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: Continuous Hydrogenation Process  
 Inventors (please provide full names): Peter Kohl; Bernhard Bruner

Earliest Priority Filing Date: Oct. 24, 2000

\*For Sequence Searches Only\* Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.

attorney elected Group 1, Claims  
1-18, Do not look at claims 19-21.

## STAFF USE ONLY

	Type of Search	Vendors and cost where applicable
Searcher: <u>Kenn BMM</u>	NA Sequence (#) _____	STN _____
Searcher Phone #: <u>305 7792</u>	AA Sequence (#) _____	Dialog _____
Searcher Location: <u>ESC 1700</u>	Structure (#) <u>✓</u>	Questel/Orbit _____
Date Searcher Picked Up: <u>8/21/03</u>	Bibliographic _____	Dr.Link _____
Date Completed: <u>8/22/03</u>	Litigation _____	Lexis/Nexis _____
Searcher Prep & Review Time: <u>6 min</u>	Fulltext _____	Sequence Systems _____
Clerical Prep Time: _____	Patent Family _____	WWW/Internet _____
Online Time: <u>12 min</u>	Other _____	Other (specify) _____

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FILE 'REGISTRY' ENTERED AT 17:02:43 ON 22 AUG 2003  
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STRUCTURE FILE UPDATES: 20 AUG 2003 HIGHEST RN 569883-36-9  
DICTIONARY FILE UPDATES: 20 AUG 2003 HIGHEST RN 569883-36-9

TSCA INFORMATION NOW CURRENT THROUGH JANUARY 6, 2003

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Crossover limits have been increased. See HELP CROSSOVER for details.

Experimental and calculated property data are now available. See HELP  
PROPERTIES for more information. See STNote 27, Searching Properties  
in the CAS Registry File, for complete details:  
<http://www.cas.org/ONLINE/STN/STNOTES/stnotes27.pdf>

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FILE COVERS 1907 - 22 Aug 2003 VOL 139 ISS 9  
FILE LAST UPDATED: 21 Aug 2003 (20030821/ED)

This file contains CAS Registry Numbers for easy and accurate  
substance identification.

=> d que  
L1 1 SEA FILE=CAPLUS ABB=ON PLU=ON DE2000-10052323/PRN,AP  
L2 2 SEA FILE=REGISTRY ABB=ON PLU=ON 84-65-1 OR 28758-94-3  
L3 28 SEA FILE=REGISTRY ABB=ON PLU=ON 7722-84-1 OR H2O2/MF

L4 34197 SEA FILE=CAPLUS ABB=ON PLU=ON L2 OR (ANTHRAQUINONE OR  
DERIVATIVE? (4A) ANTHRAQUINONE?)  
L5 94036 SEA FILE=CAPLUS ABB=ON PLU=ON L3 OR HYDROGEN (3A) PEROXIDE  
L6 860 SEA FILE=CAPLUS ABB=ON PLU=ON L4 AND L5  
L7 131 SEA FILE=CAPLUS ABB=ON PLU=ON L6 AND HYDROGENATION/IT  
L13 116 SEA FILE=CAPLUS ABB=ON PLU=ON L7 AND (IMF OR PREP OR PROC OR  
RCT OR RACT)/RL  
L14 108 SEA FILE=CAPLUS ABB=ON PLU=ON L13 AND CATALY?  
L15 36 SEA FILE=CAPLUS ABB=ON PLU=ON L14 AND MIX?  
L16 964 SEA FILE=WPIX ABB=ON PLU=ON ANTHRAQUINONE? AND DERIVATIVE? (3A  
) ANTHRAQUINONE?  
L17 27927 SEA FILE=WPIX ABB=ON PLU=ON HYDROGEN PEROXIDE OR H2O2  
L18 57 SEA FILE=WPIX ABB=ON PLU=ON L16 AND L17  
L19 16 SEA FILE=WPIX ABB=ON PLU=ON L18 AND HYDROGENATION  
L20 13 SEA FILE=WPIX ABB=ON PLU=ON L19 AND CATALY?  
L23 1 SEA FILE=JAPIO ABB=ON PLU=ON L19 AND CATALY?  
L24 48 DUP REM L15 L20 L23 (2 DUPLICATES REMOVED)  
L25 36 SEA FILE=CAPLUS L24  
L26 1 SEA FILE=CAPLUS ABB=ON PLU=ON L25 AND L1

=> d ibib abs hitstr ind total l25

L25 ANSWER 1 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN  
ACCESSION NUMBER: 2003:163793 CAPLUS  
DOCUMENT NUMBER: 138:176334  
TITLE: Loaded platinum **catalyst** for hydrogenation  
of alkyl **anthraquinone**  
INVENTOR(S): Zhu, Xiangxue; Liu, Shuwen; Xu, Xianlun  
PATENT ASSIGNEE(S): Lanzhou Inst. of Chemical Physics, Chinese Academy of  
Sciences, Peop. Rep. China  
SOURCE: Faming Zhuanli Shenqing Gongkai Shuomingshu, 6 pp.  
CODEN: CNXXEV  
DOCUMENT TYPE: Patent  
LANGUAGE: Chinese  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
CN 1347757	A	20020508	CN 2001-135538	20011010
PRIORITY APPLN. INFO.:			CN 2001-135538	20011010

AB The title **catalyst** for producing **hydrogen peroxide** through hydrogenation of alkyl **anthraquinone** is composed of Pt 0.2-0.4, K<sub>2</sub>O, Cs<sub>2</sub>O, MgO, BaO, La<sub>2</sub>O<sub>3</sub> or CeO<sub>2</sub> 0.3-1.2, and addnl. .gamma.-Al<sub>2</sub>O<sub>3</sub> as carrier to 100%. The **catalyst** is prepd. by impregnating .gamma.-Al<sub>2</sub>O<sub>3</sub> with aq. Pt salt soln., drying at 100-120.degree., calcining at 400-600.degree., impregnating with aq. soln. contg. K, Cs, Mg, Ba, La, or Ce ions, drying at 100-120.degree., and reducing at 450.degree. with the mixt. of N<sub>2</sub> and H<sub>2</sub>. The **catalyst** is highly active and selective.

IT 7722-84-1P, **Hydrogen peroxide**, preparation

RL: IMF (Industrial manufacture); PREP (Preparation)  
(loaded platinum catalyst for producing hydrogen  
peroxide through hydrogenation of alkyl  
anthraquinone)

RN 7722-84-1 CAPLUS

CN Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO-OH

IC ICM B01J023-42

ICS B01J037-02; C01B015-023

CC 67-1 (Catalysis, Reaction Kinetics, and Inorganic Reaction Mechanisms)  
Section cross-reference(s): 49

ST platinum alumina catalyst impregnation hydrogenation  
anthraquinone hydrogen peroxide manuf

IT Hydrogenation catalysts

Impregnation

(loaded platinum catalyst for producing hydrogen  
peroxide through hydrogenation of alkyl  
anthraquinone)

IT 1344-28-1, Alumina, uses 7447-40-7, Potassium chloride, uses  
7789-18-6, Cesium nitrate 10022-31-8, Barium nitrate 10377-60-3,  
Magnesium nitrate

RL: CAT (Catalyst use); CPS (Chemical process); PEP (Physical, engineering  
or chemical process); PROC (Process); USES (Uses)

(loaded platinum catalyst for producing hydrogen  
peroxide through hydrogenation of alkyl  
anthraquinone)

IT 1306-38-3P, Cerium oxide (CeO2), uses 1312-81-8P, Lanthanum oxide  
(La2O3) 7440-06-4P, Platinum, uses

RL: CAT (Catalyst use); SPN (Synthetic preparation); PREP  
(Preparation); USES (Uses)

(loaded platinum catalyst for producing hydrogen  
peroxide through hydrogenation of alkyl  
anthraquinone)

IT 7722-84-1P, Hydrogen peroxide, preparation

RL: IMF (Industrial manufacture); PREP (Preparation)

(loaded platinum catalyst for producing hydrogen  
peroxide through hydrogenation of alkyl  
anthraquinone)

IT 84-51-5, 2-Ethylanthraquinone

RL: RCT (Reactant); RACT (Reactant or reagent)

(loaded platinum catalyst for producing hydrogen  
peroxide through hydrogenation of alkyl  
anthraquinone)

L25 ANSWER 2 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 2002:880032 CAPLUS

DOCUMENT NUMBER: 137:339627

TITLE: Manufacture of hydrogen peroxide

KOROMA EIC1700

INVENTOR(S): Schirmann, Jean Pierre  
 PATENT ASSIGNEE(S): Fr.  
 SOURCE: Fr. Demande, 10 pp.  
 CODEN: FRXXBL  
 DOCUMENT TYPE: Patent  
 LANGUAGE: French  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
FR 2821343	A1	20020830	FR 2001-2694	20010228
WO 2002083553	A1	20021024	WO 2002-EP1808	20020215

W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM

RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG

PRIORITY APPLN. INFO.:  
 AB A method for manuf. of H<sub>2</sub>O<sub>2</sub> involves (1) oxidn. of a liq. mixt. of 2,2,4,4-tetramethyl-3-pentanol and 2,2,4,4-tetramethyl-3-pentanone with O<sub>2</sub> (e.g., air) at 80-120.degree. and O<sub>2</sub> partial pressure of 1-10 bar, (2) extn. of the oxidized org. phase with water and collection of an aq. phase contg. H<sub>2</sub>O<sub>2</sub> and a remaining org. phase, (3) partial hydrogenation of the org. phase on a Pd/Al<sub>2</sub>O<sub>3</sub> or Raney Ni catalyst at a H<sub>2</sub> partial pressure of 5-10 bar to increase alc./ketone mol ratio, and (4) recycling of the hydrogenated org. phase to the step 1. The product is a 30-50% aq. H<sub>2</sub>O<sub>2</sub> soln. The system output (in vol. units of the org. mixt.) is higher by a factor 5-10 compared to that of the conventional anthraquinone system.

IT 7722-84-1P, Hydrogen peroxide, preparation  
 RL: CPS (Chemical process); IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); PREP (Preparation); PROC (Process)  
 (manuf. of)  
 RN 7722-84-1 CAPLUS  
 CN Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) (9CI) (CA INDEX NAME)

HO-OH

IC ICM C01B015-026  
 CC 49-2 (Industrial Inorganic Chemicals)  
 ST hydrogen peroxide manuf  
 IT Hydrogenation  
 Oxidation

KOROMA EIC1700

(of alc.-ketone mixt. in manuf. of hydrogen peroxide)

IT 7440-02-0, Nickel, uses 7440-05-3, Palladium, uses  
 RL: CAT (Catalyst use); USES (Uses)  
 (hydrogenation catalyst in manuf. of hydrogen peroxide)

IT 815-24-7, 2,2,4,4-Tetramethyl-3-pentanone 14609-79-1,  
 2,2,4,4-Tetramethyl-3-pentanol  
 RL: RCT (Reactant); RACT (Reactant or reagent)  
 (in manuf. of hydrogen peroxide)

IT 7722-84-1P, Hydrogen peroxide, preparation  
 RL: CPS (Chemical process); IMF (Industrial manufacture); PEP  
 (Physical, engineering or chemical process); PREP (Preparation);  
 PROC (Process)  
 (manuf. of)

L25 ANSWER 3 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN  
 ACCESSION NUMBER: 2002:332709 CAPLUS  
 DOCUMENT NUMBER: 136:342988  
 TITLE: Hydrogen peroxide manufacture in  
 recirculation reactor with venturi nozzle  
 mixing of reactants  
 INVENTOR(S): Korl, Peter; Maurer, Bernhard  
 PATENT ASSIGNEE(S): Austria  
 SOURCE: U.S. Pat. Appl. Publ., 6 pp.  
 CODEN: USXXCO  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2002052532	A1	20020502	US 2001-982108	20011019
DE 10052323	A1	20020502	DE 2000-10052323	20001021
WO 2002034668	A1	20020502	WO 2001-EP9722	20010823
W: AU, BR, CA, CN, CZ, HR, ID, IL, IN, JP, KR, MX, NZ, PL, RO, RU, SI, SK, ZA				
RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR				
AU 2001089827	A5	20020506	AU 2001-89827	20010823
EP 1334062	A1	20030813	EP 2001-969632	20010823
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, FI, RO, CY, TR				

PRIORITY APPLN. INFO.: DE 2000-10052323 A 20001021  
 WO 2001-EP9722 W 20010823

AB A ~~continuous catalytic~~ hydrogenation process is described in which a reaction mixt. suspension, contg. the substance to be hydrogenated, the hydrogenation product, hydrogen, and the hydrogenation catalyst, is recirculated in the reactor. Part of the hydrogenation product is removed from the reactor and the substance to be hydrogenated and hydrogen are fed into the reaction. The substance to be

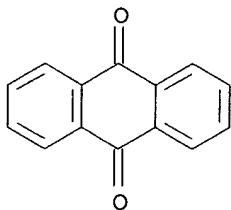
hydrogenated and the hydrogen are mixed, preferably in a venturi nozzle, before entering the reactor. The process is esp. suitable for the cyclic manuf. of hydrogen peroxide in the anthraquinone process, in which the substance to be hydrogenated is a coalescence-inhibited system contg. a mixt. of substituted anthraquinone and/or partially ring-hydrogenated tetrahydro derivs. Hydrogenation is carried out in a stirred, gas-lift, loop, or fluidized-bed reactors.

IT 84-65-1D, Anthraquinone, alkyl derivs.  
28758-94-3D, Anthraquinone, tetrahydro-, alkyl derivs.

RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)  
(hydrogenation of; hydrogen peroxide manuf. in recirculation reactor with venturi nozzle mixing of reactants)

RN 84-65-1 CAPLUS

CN 9,10-Anthracenedione (9CI) (CA INDEX NAME)



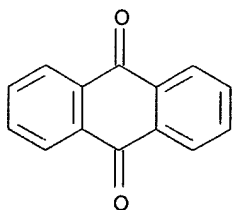
RN 28758-94-3 CAPLUS

CN 9,10-Anthracenedione, tetrahydro- (9CI) (CA INDEX NAME)

CM 1

CRN 84-65-1

CMF C14 H8 O2



IT 7722-84-1P, Hydrogen peroxide, preparation

RL: IMF (Industrial manufacture); PREP (Preparation)  
(manuf. of; hydrogen peroxide manuf. in recirculation reactor with venturi nozzle mixing of

reactants)

RN 7722-84-1 CAPLUS

CN Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO-OH

IC ICM C01B015-023

ICS C07C005-02

NCL 585250000

CC 49-8 (Industrial Inorganic Chemicals)

Section cross-reference(s): 48

ST hydrogenation anthraquinone process hydrogen peroxide manuf; nozzle mixing hydrogen

peroxide manuf anthraquinone hydrogenation reactor

IT Hydrogenation

(app., reactors; hydrogen peroxide manuf. in recirculation reactor with venturi nozzle mixing of reactants)

IT Hydrogenation

(continuous; hydrogen peroxide manuf. in recirculation reactor with venturi nozzle mixing of reactants)

IT Reactors

(hydrogenation, reactors; hydrogen peroxide manuf. in recirculation reactor with venturi nozzle mixing of reactants)

IT Nozzles

(venturi; hydrogen peroxide manuf. in recirculation reactor with venturi nozzle mixing of reactants)

IT 84-65-1D, Anthraquinone, alkyl derivs.

28758-94-3D, Anthraquinone, tetrahydro-, alkyl derivs.

RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT

(Reactant or reagent)

(hydrogenation of; hydrogen peroxide

manuf. in recirculation reactor with venturi nozzle mixing of reactants)

IT 7722-84-1P, Hydrogen peroxide, preparation

RL: IMF (Industrial manufacture); PREP (Preparation)

(manuf. of; hydrogen peroxide manuf. in

recirculation reactor with venturi nozzle mixing of reactants)

L25 ANSWER 4 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 2001:375406 CAPLUS

DOCUMENT NUMBER: 134:355170

TITLE: Process and composition for the production of hydrogen peroxide

INVENTOR(S): Nystrom, Mats; Jarnvik, Christina; Thor, Hans; Saari,



Seppo  
 \*PATENT ASSIGNEE(S): Akzo Nobel N.V., Neth.; Eka Chemicals AB  
 SOURCE: Eur. Pat. Appl., 9 pp.  
 CODEN: EPXXDW  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 1101733	A1	20010523	EP 2000-850170	20001020
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
JP 2001163608	A2	20010619	JP 2000-346518	20001114
US 6524547	B1	20030225	US 2000-715103	20001120
NO 2000005893	A	20010523	NO 2000-5893	20001121
BR 2000005492	A	20010724	BR 2000-5492	20001121
RU 2196106	C2	20030110	RU 2000-129189	20001121
CN 1296911	A	20010530	CN 2000-130951	20001122

PRIORITY APPLN. INFO.: EP 1999-850175 A 19991122

AB A process for prodn. of H2O2 according to the anthraquinone process comprises the steps of: alternate hydrogenation and oxidn. of anthraquinone and tetrahydroanthraquinones in a working soln. The working soln. to be hydrogenated comprises a mixt. of alkyl-substituted anthraquinones and alkyl-substituted tetrahydroanthraquinones dissolved in at least one org. solvent, wherein from 10-55 mol% of the anthraquinones and the tetrahydroanthraquinones are substituted with one amy group, and the molar ratio of alkyl-substituted tetrahydroanthraquinones to alkyl-substituted anthraquinones is at least 1:1.

IT 7722-84-1P, Hydrogen peroxide, preparation  
 RL: IMF (Industrial manufacture); PREP (Preparation)  
 (process and compn. for prodn. of hydrogen peroxide)

RN 7722-84-1 CAPLUS

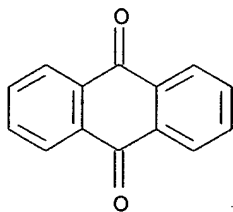
CN Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO-OH

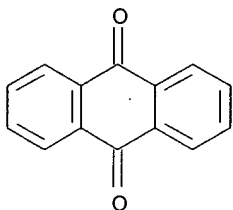
IT 84-65-1D, Anthraquinone, alkyl-substituted  
 28758-94-3D, TetrahydroAnthraquinone, alkyl-substituted  
 RL: RCT (Reactant); RACT (Reactant or reagent)  
 (process and compn. for prodn. of hydrogen peroxide)

RN 84-65-1 CAPLUS

CN 9,10-Anthracenedione (9CI) (CA INDEX NAME)



RN 28758-94-3 CAPLUS  
CN 9,10-Anthracenedione, tetrahydro- (9CI) (CA INDEX NAME)  
  
CM 1  
  
CRN 84-65-1  
CMF C14 H8 O2



IC ICM C01B015-023  
CC 49-8 (Industrial Inorganic Chemicals)  
ST **hydrogen peroxide** manuf **anthraquinone**  
process  
IT Aromatic hydrocarbons, uses  
RL: TEM (Technical or engineered material use); USES (Uses)  
(C9-10; process and compn. for prodn. of **hydrogen peroxide**)  
IT **Hydrogenation**  
**Hydrogenation catalysts**  
Oxidation  
(process and compn. for prodn. of **hydrogen peroxide**)  
)  
IT 7440-05-3, Palladium, uses 7631-86-9, Silica, uses  
RL: CAT (Catalyst use); USES (Uses)  
(process and compn. for prodn. of **hydrogen peroxide**)  
)  
IT 123-31-9, Hydroquinone, formation (nonpreparative)  
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)  
(process and compn. for prodn. of **hydrogen peroxide**)  
)  
IT 7722-84-1P, **Hydrogen peroxide**, preparation  
RL: IMF (Industrial manufacture); PREP (Preparation)  
(process and compn. for prodn. of **hydrogen peroxide**)

- )
- IT 64111-86-0, Amyl anthraquinone  
RL: MOA (Modifier or additive use); USES (Uses)  
(process and compn. for prodn. of hydrogen peroxide)
  - )
  - IT 84-65-1D, Anthraquinone, alkyl-substituted 1333-74-0,  
Hydrogen, reactions 28758-94-3D, TetrahydroAnthraquinone,  
alkyl-substituted 50674-60-7, Ethylanthraquinone 56854-78-5  
RL: RCT (Reactant); RACT (Reactant or reagent)  
(process and compn. for prodn. of hydrogen peroxide)
  - )
  - IT 1806-54-8, Trioctylphosphate 4559-86-8, Tetrabutyl urea 25551-13-7,  
Trimethylbenzene 59227-88-2, n-Octyl caprolactam  
RL: TEM (Technical or engineered material use); USES (Uses)  
(process and compn. for prodn. of hydrogen peroxide)
  - )

REFERENCE COUNT: 7 THERE ARE 7 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L25 ANSWER 5 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 2001:338443 CAPLUS

DOCUMENT NUMBER: 134:342126

TITLE: Hydrogenation reactor parameters in manufacture of hydrogen peroxide by two-step anthraquinone process

INVENTOR(S): Haas, Thomas; Glenneberg, Juergen; Wagner, Rudolf; Creutz, Matthias; Sauer, Joerg; Vanheertum, Rudolf

PATENT ASSIGNEE(S): Degussa A.-G., Germany

SOURCE: PCT Int. Appl., 19 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: German

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2001032557	A1	20010510	WO 2000-EP10532	20001026
W: AU, BR, CA, CN, CZ, ID, IL, IN, JP, KR, MX, NZ, PL, RO, RU, SI, TR, ZA				
RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE				
DE 19953185	A1	20010523	DE 1999-19953185	19991105
BR 2000015363	A	20020618	BR 2000-15363	20001026
EP 1230148	A1	20020814	EP 2000-975919	20001026
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, SI, FI, RO, CY				
TW 500692	B	20020901	TW 2000-89122836	20001030
US 6447744	B1	20020910	US 2000-706184	20001106
PRIORITY APPLN. INFO.: DE 1999-19953185 A 19991105				
WO 2000-EP10532 W 20001026				

AB Hydrogen peroxide is manufd. by the

anthraquinone process, consisting of hydrogenation and oxidn. steps, in which the hydrogenation step is carried out in a vertical bubble column reactor in which a mixt. of a hydrogen-contg. gas phase and a working soln. (contg. the anthraquinone reaction carrier) is fed to the column from the bottom to the top at 10-100.degree. and 0.1-2 MPa, with the hydrogen-contg. gas phase fed at an empty pipe velocity of 0.05-100 m/h, preferably 10-50 m/h. The reaction is carried out until no H2 is detected at the top of the column. The bubble column reactor contains a fixed-bed catalyst consisting of supported precious metal catalysts (esp. Pd) with an av. particle diam. of 0.5-20 mm.

IT 7722-84-1P, Hydrogen peroxide, preparation  
 RL: IMF (Industrial manufacture); PREP (Preparation)  
 (hydrogenation reactor parameters in manuf. of  
 hydrogen peroxide by two-step anthraquinone  
 process)  
 RN 7722-84-1 CAPLUS  
 CN Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO-OH

IC ICM C01B015-023  
 ICS B01J008-02  
 CC 49-8 (Industrial Inorganic Chemicals)  
 Section cross-reference(s): 48  
 ST hydrogen peroxide manuf anthraquinone  
 process; palladium hydrogen peroxide manuf  
 anthraquinone process  
 IT Hydrogenation  
 (app., bubble column; hydrogenation reactor parameters in  
 manuf. of hydrogen peroxide by two-step  
 anthraquinone process)  
 IT Precious metals  
 RL: CAT (Catalyst use); USES (Uses)  
 (hydrogenation catalysts; hydrogenation  
 reactor parameters in manuf. of hydrogen peroxide  
 by two-step anthraquinone process)  
 IT Hydrogenation  
 Hydrogenation catalysts  
 Redox reaction  
 (hydrogenation reactor parameters in manuf. of  
 hydrogen peroxide by two-step anthraquinone  
 process)  
 IT Reactors  
 (hydrogenation, bubble column; hydrogenation  
 reactor parameters in manuf. of hydrogen peroxide  
 by two-step anthraquinone process)  
 IT 28555-16-0, 2-Ethyltetrahydroanthraquinone  
 RL: FMU (Formation, unclassified); PEP (Physical, engineering or chemical  
 process); RCT (Reactant); FORM (Formation, nonpreparative);

PROC (Process); RACT (Reactant or reagent)

(formation and dehydrogenation of; hydrogenation reactor parameters in manuf. of hydrogen peroxide by two-step anthraquinone process)

IT 84-51-5, 2-Ethylanthraquinone

RL: FMU (Formation, unclassified); PEP (Physical, engineering or chemical process); RCT (Reactant); FORM (Formation, nonpreparative);

PROC (Process); RACT (Reactant or reagent)

(formation and hydrogenation of; hydrogenation reactor parameters in manuf. of hydrogen peroxide by two-step anthraquinone process)

IT 7440-05-3, Palladium, uses

RL: CAT (Catalyst use); USES (Uses)

(hydrogenation catalysts; hydrogenation reactor parameters in manuf. of hydrogen peroxide by two-step anthraquinone process)

IT 7722-84-1P, Hydrogen peroxide, preparation

RL: IMF (Industrial manufacture); PREP (Preparation)

(hydrogenation reactor parameters in manuf. of hydrogen peroxide by two-step anthraquinone process)

REFERENCE COUNT: 5 THERE ARE 5 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L25 ANSWER 6 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 2001:132853 CAPLUS

DOCUMENT NUMBER: 134:153147

TITLE: Preparation of high-efficiency bimetal-supported catalyst for production of hydrogen peroxide from anthraquinone

INVENTOR(S): Xu, Xianlun; Liu, Shuwen; Tang, Aihua; Li, Shengli

PATENT ASSIGNEE(S): Lanzhou Inst. of Chemical Physics, Chinese Academy of Sciences, Peop. Rep. China

SOURCE: Faming Zhuanli Shenqing Gongkai Shuomingshu, 4 pp.  
CODEN: CNXXEV

DOCUMENT TYPE: Patent

LANGUAGE: Chinese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
CN 1259483	A	20000712	CN 1999-126993	19991224
CN 1092137	B	20021009		

PRIORITY APPLN. INFO.: CN 1999-126993 19991224

AB The catalyst contains Pt 0.1-0.3, Ni or Co or Ru 0.1-0.5, and CaO or MgO 0.01-0.1%, using Al<sub>2</sub>O<sub>3</sub> or TiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub> calcined at 950.degree. as carrier, with sp. surface area below 100 m<sup>2</sup> g<sup>-1</sup> and Na<sub>2</sub>O content below 0.05%. The process comprises immersing carrier in the mixed soln. of Pt salt and competitive adsorbent, drying at 100-120.degree., calcining at 520.degree., immersing in mixed soln. of Ni(NO<sub>3</sub>)<sub>2</sub> or Co(NO<sub>3</sub>)<sub>2</sub> and Ca salt, drying, calcining, and activating at 450.degree.

with N<sub>2</sub>/H<sub>2</sub>. The competitive adsorbent is selected from citric acid, maleic acid, acetic acid, or lactic acid. H<sub>2</sub>O<sub>2</sub> is prepd. from 2-ethylanthraquinone in the presence of catalyst at 40.degree., 0.3 MPa and LHSV 10-15 h<sup>-1</sup>, using heavy aroms. and trioctyl phosphate as working soln. The hydrogenation percentage (per L working soln.) is up to 7-9 g H<sub>2</sub>O<sub>2</sub>, and the degrdn. product less than 0.5 g/L H<sub>2</sub>O<sub>2</sub>.

IT 7722-84-1P, Hydrogen peroxide, preparation  
RL: IMF (Industrial manufacture); PREP (Preparation)  
(prepn. of high-efficiency bimetal-supported catalyst for  
prodn. of hydrogen peroxide from  
anthraquinone)

RN 7722-84-1 CAPLUS

CN Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) (9CI) (CA INDEX NAME)

HO-OH

IC ICM C01B015-023

ICS B01J023-889; B01J032-00; B01J037-20

CC 67-1 (Catalysis, Reaction Kinetics, and Inorganic Reaction Mechanisms)

ST ethylanthraquinone hydrogenation oxidn bimetal catalyst; hydrgen  
peroxide manuf catalyst bimetal

IT Hydrogenation catalysts

Oxidation catalysts

(prepn. of high-efficiency bimetal-supported catalyst for  
prodn. of hydrogen peroxide from  
anthraquinone)

IT 7440-02-0, Nickel, uses 7440-06-4, Platinum, uses 7440-18-8,  
Ruthenium, uses 7440-48-4, Cobalt, uses

RL: CAT (Catalyst use); USES (Uses)

(prepn. of high-efficiency bimetal-supported catalyst for  
prodn. of hydrogen peroxide from  
anthraquinone)

IT 10124-37-5, Calcium nitrate 10141-05-6, Cobalt nitrate 10377-60-3,  
Magnesium nitrate 13138-45-9, Nickel nitrate 15825-24-8

RL: CAT (Catalyst use); RCT (Reactant); RACT (Reactant or  
reagent); USES (Uses)

(prepn. of high-efficiency bimetal-supported catalyst for  
prodn. of hydrogen peroxide from  
anthraquinone)

IT 7722-84-1P, Hydrogen peroxide, preparation

RL: IMF (Industrial manufacture); PREP (Preparation)

(prepn. of high-efficiency bimetal-supported catalyst for  
prodn. of hydrogen peroxide from  
anthraquinone)

IT 84-51-5, 2-Ethylanthraquinone

RL: RCT (Reactant); RACT (Reactant or reagent)

(prepn. of high-efficiency bimetal-supported catalyst for  
prodn. of hydrogen peroxide from  
anthraquinone)

L25 ANSWER 7 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1999:565986 CAPLUS

DOCUMENT NUMBER: I31:172250

TITLE: Suspension hydrogenation of an anthraquinone compound in a special reactor for hydrogen peroxide production

INVENTOR(S): Boettcher, Arnd; Henkelmann, Jochem; Broecker, Franz Josef; Kaibel, Gerd; Ruetter, Heinz

PATENT ASSIGNEE(S): BASF Aktiengesellschaft, Germany

SOURCE: PCT Int. Appl., 21 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: German

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

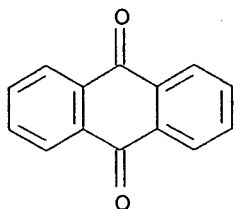
PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 9943611	A1	19990902	WO 1999-EP1324	19990301
W: CA, CN, ID, JP, KR, MX, SG, US				
RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE				
DE 19808385	A1	19990902	DE 1998-19808385	19980227
CA 2322192	AA	19990902	CA 1999-2322192	19990301
EP 1056682	A1	20001206	EP 1999-913205	19990301
EP 1056682	B1	20020925		
R: BE, CH, DE, ES, FR, GB, IT, LI, NL				
JP 2002504474	T2	20020212	JP 2000-533377	19990301
US 6521767	B1	20030218	US 2000-622852	20000828
PRIORITY APPLN. INFO.:			DE 1998-19808385 A	19980227
			WO 1999-EP1324 W	19990301

AB A method is disclosed for suspension hydrogenation of an anthraquinone compd. or a mixt. comprised of .gtoreq.2 anthraquinone compds. in a reactor contg. a working soln. in which .gtoreq.1 catalyst is suspended and an addnl. H-contg. gas phase. The working soln. and the gas phase are at least partially fed into the reactor through a device with openings or channels whose hydraulic diam. is 0.5-20 mm, preferably 1-3 mm.

IT 84-65-1D, Anthraquinone, compds.  
 RL: PEP (Physical, engineering or chemical process); PROC (Process)  
 (in hydrogen peroxide manuf. by suspension hydrogenation of)

RN 84-65-1 CAPLUS

CN 9,10-Anthracenedione (9CI) (CA INDEX NAME)



IT 7722-84-1P, Hydrogen peroxide, preparation  
RL: IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); PREP (Preparation); PROC (Process)  
(manuf. by suspension hydrogenation of anthraquinone compd.)  
RN 7722-84-1 CAPLUS  
CN Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO-OH

IC ICM C01B015-023  
CC 49-2 (Industrial Inorganic Chemicals)  
ST hydrogen peroxide manuf anthraquinone suspension hydrogenation  
IT Hydrogenation catalysts  
(in suspension hydrogenation of anthraquinone compd. in hydrogen peroxide prodn.)  
IT Hydrogenation  
(suspension; suspension hydrogenation of anthraquinone compd. in hydrogen peroxide prodn.)  
IT 1344-28-1, Alumina, uses 7440-05-3, Palladium, uses  
RL: CAT (Catalyst use); USES (Uses)  
(in catalyst for suspension hydrogenation of anthraquinone compd. in hydrogen peroxide prodn.)  
IT 84-65-1D, Anthraquinone, compds.  
RL: PEP (Physical, engineering or chemical process); PROC (Process)  
(in hydrogen peroxide manuf. by suspension hydrogenation of)  
IT 84-51-5, 2-Ethylanthraquinone 839-73-6, 2-Ethylanthrahydroquinone  
RL: PEP (Physical, engineering or chemical process); PROC (Process)  
(in hydrogen peroxide manuf. by suspension hydrogenation of anthraquinone compd.)  
IT 7722-84-1P, Hydrogen peroxide, preparation  
RL: IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); PREP (Preparation); PROC (Process)  
(manuf. by suspension hydrogenation of anthraquinone



compd.)

REFERENCE COUNT: 3 THERE ARE 3 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L25 ANSWER 8 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1999:511099 CAPLUS

DOCUMENT NUMBER: 131:131938

TITLE: Process for the manufacture of hydrogen peroxide

INVENTOR(S): Vandenberg, Dominique; Ganhy, Jean-pierre; Vanlaudem, Noel

PATENT ASSIGNEE(S): Solvay (Societe Anonyme), Belg.

SOURCE: PCT Int. Appl., 19 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 9940024	A1	19990812	WO 1999-EP850	19990204
W: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM				
RW: GH, GM, KE, LS, MW, SD, SZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG				
GB 2334028	A1	19990811	GB 1998-2405	19980204
CA 2319337	AA	19990812	CA 1999-2319337	19990204
AU 9927246	A1	19990823	AU 1999-27246	19990204
EP 1051352	A1	20001115	EP 1999-907528	19990204
EP 1051352	B1	20030507		
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, FI				
BR 9908780	A	20001205	BR 1999-8780	19990204
JP 2002502794	T2	20020129	JP 2000-530462	19990204
AT 239670	E	20030515	AT 1999-907528	19990204
PRIORITY APPLN. INFO.:				
			GB 1998-2405	A 19980204
			WO 1999-EP850	W 19990204

AB A process is disclosed concerning the manuf. of hydrogen peroxide by the so-called anthraquinone process (AO-process), and in particular concerning the improvement of an essential process step of the AO-process, i.e. an improvement of the hydrogenation step. The inventive hydrogenation step of the AO-process is carried out in a conventional hydrogenation reactor contg. a fixed bed of the hydrogenation catalyst by passing a foaming mixt., which is formed of the anthraquinone contg. working soln. and the hydrogenating gas, downwards through the fixed-bed catalyst.

IT 7722-84-1P, Hydrogen peroxide, preparation  
RL: IMF (Industrial manufacture); PREP (Preparation)  
(process for manuf. of hydrogen peroxide)  
RN 7722-84-1 CAPLUS  
CN Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO-OH

IC ICM C01B015-023  
CC 49-8 (Industrial Inorganic Chemicals)  
ST hydrogen peroxide manuf anthraquinone  
process  
IT Alcohols, reactions  
RL: RCT (Reactant); RACT (Reactant or reagent)  
(org.; process for manuf. of hydrogen peroxide)  
IT Hydrogenation catalysts  
(process for manuf. of hydrogen peroxide)  
IT Aromatic hydrocarbons, reactions  
RL: RCT (Reactant); RACT (Reactant or reagent)  
(process for manuf. of hydrogen peroxide)  
IT Noble gases, uses  
RL: TEM (Technical or engineered material use); USES (Uses)  
(process for manuf. of hydrogen peroxide)  
IT 1344-28-1, Alumina, uses 7440-05-3, Palladium, uses 7631-86-9, Silica,  
uses  
RL: CAT (Catalyst use); USES (Uses)  
(process for manuf. of hydrogen peroxide)  
IT 7722-84-1P, Hydrogen peroxide, preparation  
RL: IMF (Industrial manufacture); PREP (Preparation)  
(process for manuf. of hydrogen peroxide)  
IT 1333-74-0, Hydrogen, reactions 13936-21-5, 2-Amylanthraquinone  
RL: RCT (Reactant); RACT (Reactant or reagent)  
(process for manuf. of hydrogen peroxide)  
IT 124-38-9, Carbon dioxide, uses 7727-37-9, Nitrogen, uses  
RL: TEM (Technical or engineered material use); USES (Uses)  
(process for manuf. of hydrogen peroxide)  
REFERENCE COUNT: 5 THERE ARE 5 CITED REFERENCES AVAILABLE FOR THIS  
RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L25 ANSWER 9 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN  
ACCESSION NUMBER: 1999:286215 CAPLUS  
DOCUMENT NUMBER: 130:311621  
TITLE: Hydrogenation of anthraquinones in presence  
of group VIII metal catalysts.  
INVENTOR(S): Boettcher, Arnd; Henkelmann, Jochem; Broecker, Franz  
Josef  
PATENT ASSIGNEE(S): BASF A.-G., Germany  
SOURCE: Ger. Offen., 10 pp.  
CODEN: GWXXBX  
DOCUMENT TYPE: Patent

LANGUAGE: German

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
DE 19747407	A1	19990429	DE 1997-19747407	19971027
CA 2308459	AA	19990506	CA 1998-2308459	19981026
WO 9921792	A1	19990506	WO 1998-EP6789	19981026
W: AL, AU, BG, BR, BY, CA, CN, CZ, GE, HU, ID, IL, JP, KR, KZ, LT, LV, MX, NO, NZ, PL, RO, RU, SG, SI, SK, TR, UA, US, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM				
RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE				
AU 9915575	A1	19990517	AU 1999-15575	19981026
EP 1027282	A1	20000816	EP 1998-959803	19981026
R: BE, CH, DE, ES, FR, GB, IT, LI, NL				
JP 2001521012	T2	20011106	JP 2000-517908	19981026
US 2002012627	A1	20020131	US 2000-529404	20000426
US 6464954	B2	20021015		

PRIORITY APPLN. INFO.:

DE 1997-19747407 A 19971027  
WO 1998-EP6789 W 19981026

OTHER SOURCE(S): CASREACT 130:311621

AB Anthraquinones or mixts. of anthraquinones were hydrogenated using supported catalysts prepd. in situ comprising ~~gtoreq.~~ group VIII metal compds. Thus, a mixt. of 2-ethylanthraquinone, Shellsol, tetrabutylurea, and ruthenium nitrosyl nitrate was placed in an autoclave contg. Pd-plated metal screen at 60.degree. and 10 bar for 1 h to give 75% conversion of starting material.

IT 7722-84-1P, Hydrogen peroxide, preparation  
RL: IMF (Industrial manufacture); SPN (Synthetic preparation);  
PREP (Preparation)

(hydrogenation of anthraquinones in presence of group VIII metal catalysts)

RN 7722-84-1 CAPLUS

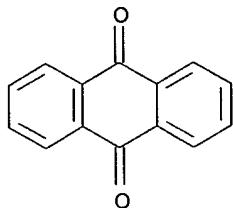
CN Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO-OH

IT 84-65-1D, Anthraquinone, derivs.  
RL: RCT (Reactant); RACT (Reactant or reagent)  
(hydrogenation of anthraquinones in presence of group VIII metal catalysts)

RN 84-65-1 CAPLUS

CN 9,10-Anthracenedione (9CI) (CA INDEX NAME)



IC ICM C07C039-08  
ICS C07C037-00; C01B015-023; C01B015-013  
ICA B01J023-40; B01J023-46  
CC 25-27 (Benzene, Its Derivatives, and Condensed Benzenoid Compounds)  
Section cross-reference(s): 78  
ST anthraquinone catalytic hydrogenation ruthenium  
catalyst; hydrogen peroxide prepn  
IT Hydrogenation  
Hydrogenation catalysts  
(hydrogenation of anthraquinones in presence of  
group VIII metal catalysts)  
IT Group VIII elements  
RL: CAT (Catalyst use); USES (Uses)  
(hydrogenation of anthraquinones in presence of  
group VIII metal catalysts)  
IT 34513-98-9, Ruthenium nitrosyl nitrate  
RL: CAT (Catalyst use); USES (Uses)  
(hydrogenation of anthraquinones in presence of  
group VIII metal catalysts)  
IT 839-73-6P, 2-Ethylanthrahydroquinone 7722-84-1P,  
Hydrogen peroxide, preparation  
RL: IMF (Industrial manufacture); SPN (Synthetic preparation);  
PREP (Preparation)  
(hydrogenation of anthraquinones in presence of  
group VIII metal catalysts)  
IT 84-51-5, 2-Ethylanthraquinone 84-65-1D, Anthraquinone,  
derivs.  
RL: RCT (Reactant); RACT (Reactant or reagent)  
(hydrogenation of anthraquinones in presence of  
group VIII metal catalysts)

L25 ANSWER 10 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1998:504827 CAPLUS

DOCUMENT NUMBER: 129:150850

TITLE: Process, especially two-stage process, and immobilized  
solid anthraquinone derivative for  
manufacturing hydrogen peroxide,  
and manufacture of the solid anthraquinone  
derivative

INVENTOR(S): Guillet, James E.; Friedman, Gad

PATENT ASSIGNEE(S): Israel

SOURCE: U.S., 8 pp., Cont.-in-part of U.S. 5,374,339.

CODEN: USXXAM

DOCUMENT TYPE:

Patent

LANGUAGE:

English

FAMILY ACC. NUM. COUNT: 2

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 5785943	A	19980728	US 1994-323423	19941014
US 5374339	A	19941220	US 1993-136020	19931014

PRIORITY APPLN. INFO.: US 1993-136020 19931014

AB The process comprises reacting O, in the presence of a solvent, with supported anthrahydroquinone (I) moieties attached to a macromol. inert support to oxidize the supported I moieties to supported anthraquinone (II) moieties with formation of H<sub>2</sub>O<sub>2</sub>, and recovering the H<sub>2</sub>O<sub>2</sub> formed as a soln. in the solvent, the supported II being insol. in the solvent under conditions of H<sub>2</sub>O<sub>2</sub> soln. recovery. The 2-stage process comprises (1) reacting a H-donating org. substrate with supported II moieties attached to an inert macromol. support to reduce the supported II moieties to supported I moieties, and (2) reacting the supported I moieties with O to produce H<sub>2</sub>O<sub>2</sub> and to reform supported II moieties ready for further reaction in a repeated 1st stage. The solid, immobilized II deriv. comprises a SiO<sub>2</sub> or glass support material having II moieties chem. attached thereto through covalent linkages, which II moieties contain free, reducible oxo groups, the immobilized II deriv. being chem. reducible to its corresponding immobilized I deriv. which in turn is chem. oxidizable to the II deriv. to provide a cyclic redn.-oxidn. process, and both derivs. are substantially insol. in aq. liqs., polar org. liqs., and nonpolar org. liqs. to form a solid phase in reaction mixts. contg. such liqs. as reaction medium. The immobilized II derivs. are manufd. by treating SiO<sub>2</sub> or glass with a silane coupling compd carrying a functional group to produce functional group-derivatized SiO<sub>2</sub>, and covalently bonding a substituted II to the SiO<sub>2</sub> via the functional groups.

IT 7722-84-1P, Hydrogen peroxide, preparation

RL: IMF (Industrial manufacture); PREP (Preparation)

(manuf. of; oxidn. of anthrahydroquinone deriv. attached to macromol. inert support for)

RN 7722-84-1 CAPLUS

CN Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) (9CI) (CA INDEX NAME)

HO-OH

IC ICM B05D007-24

ICS B32B017-02; B32B018-00; C01B015-023

NCL 423588000

CC 49-8 (Industrial Inorganic Chemicals)

ST oxygen anthrahydroquinone oxidn anthraquinone hydrogen peroxide; silica support anthrahydroquinone; immobilization

anthrahydroquinone silica; silane coupling compd silica anthrahydroquinone

IT Hydrogenation catalysts

KOROMA EIC1700

- (for anthraquinone deriv. redn. in hydrogen peroxide manuf. by oxidn. of anthrahydroquinone bonded to inert support)
- IT Hydrogenation  
(of anthraquinone deriv. in hydrogen peroxide manuf. by oxidn. of anthrahydroquinone bonded to inert support)
- IT Silica gel, uses  
RL: TEM (Technical or engineered material use); USES (Uses)  
(support; in hydrogen peroxide manuf. by oxidn. of anthrahydroquinone bonded to)
- IT Glass, uses  
Glass fibers, uses  
RL: TEM (Technical or engineered material use); USES (Uses)  
(supports; in hydrogen peroxide manuf. by oxidn. of anthrahydroquinone bonded to)
- IT 7631-86-9, Silica, uses  
RL: TEM (Technical or engineered material use); USES (Uses)  
(colloidal, support; in hydrogen peroxide manuf. by oxidn. of anthrahydroquinone bonded to)
- IT 13822-56-5, Aminopropyl trimethoxysilane  
RL: NUU (Other use, unclassified); USES (Uses)  
(coupling agent; for bonding anthraquinone deriv. to inert support in hydrogen peroxide manuf.)
- IT 603-35-0, Triphenylphosphine, uses  
RL: CAT (Catalyst use); USES (Uses)  
(hydrogenation catalyst complex with ruthenium; for anthraquinone deriv. redn. in hydrogen peroxide manuf. by oxidn. of anthrahydroquinone bonded to inert support)
- IT 7440-18-8, Ruthenium, uses  
RL: CAT (Catalyst use); USES (Uses)  
(hydrogenation catalyst complex with triphenylphosphine; for anthraquinone deriv. redn. in hydrogen peroxide manuf. by oxidn. of anthrahydroquinone bonded to inert support)
- IT 7647-10-1, Palladium chloride 14971-18-7  
RL: CAT (Catalyst use); USES (Uses)  
(hydrogenation catalyst; for anthraquinone deriv. redn. in hydrogen peroxide manuf. by oxidn. of anthrahydroquinone bonded to inert support)
- IT 108-88-3, Toluene, reactions  
RL: RCT (Reactant); RACT (Reactant or reagent)  
(irradn. of; hydrogen peroxide manuf. by)
- IT 7722-84-1P, Hydrogen peroxide, preparation  
RL: IMF (Industrial manufacture); PREP (Preparation)  
(manuf. of; oxidn. of anthrahydroquinone deriv. attached to macromol. inert support for)
- IT 7782-44-7, Oxygen, reactions  
RL: RCT (Reactant); RACT (Reactant or reagent)  
(oxidn. with; of supported anthrahydroquinone derivs. attached to macromol. inert support in hydrogen peroxide

manuf.)

IT 56-81-5, Glycerin, reactions  
 RL: RCT (Reactant); RACT (Reactant or reagent)  
 (photooxidn. of; hydrogen peroxide manuf. by)

IT 7757-83-7 7775-14-6, Sodium dithionite 16940-66-2, Sodium borohydride  
 25895-60-7, Sodium cyanoborohydride  
 RL: RCT (Reactant); RACT (Reactant or reagent)  
 (reducing agent; in hydrogen peroxide manuf. by  
 oxidn. of anthrahydroquinone bonded to inert support)

IT 9002-88-4, Polyethylene 9004-34-6, Cellulose., uses  
 RL: TEM (Technical or engineered material use); USES (Uses)  
 (support, bonding to; of anthrahydroquinone deriv. for oxidn.  
 to anthraquinone and hydrogen peroxide)

IT 84-49-1 5776-56-7 6470-87-7 84122-61-2, Anthraquinone  
 carboxylic acid 161121-80-8 161121-81-9  
 RL: PEP (Physical, engineering or chemical process); PROC  
 (Process)  
 (supported, immobilized; in two-stage process for hydrogen  
 peroxide manuf.)

REFERENCE COUNT: 8 THERE ARE 8 CITED REFERENCES AVAILABLE FOR THIS  
 RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L25 ANSWER 11 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1996:456102 CAPLUS

DOCUMENT NUMBER: 125:90628

TITLE: Hydrogenation catalyst comprising palladium  
 on a support for hydrogen peroxide  
 manufacture by anthraquinone process

INVENTOR(S): Jenkins, Colie Lawrence; Kirby, Fred Bronson; Koch,  
 Theodore Augur

PATENT ASSIGNEE(S): E.I. Du Pont De Nemours and Company, USA

SOURCE: PCT Int. Appl., 18 pp.  
 CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 2

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 9618574	A1	19960620	WO 1995-US16336	19951214
W: BR, CA, JP, KR, NZ				
US 5772977	A	19980630	US 1995-549586	19951027
BR 9510373	A	19980602	BR 1995-10373	19951214
JP 10510796	T2	19981020	JP 1995-519267	19951214
PRIORITY APPLN. INFO.:			US 1994-355783	19941214
			US 1995-549586	19951027
			WO 1995-US16336	19951214

AB A catalyst comprising 0.2-10 wt.% of metallic palladium and a  
 calcined oxide or calcined mixed oxide support having pore diam.  
 of 50-1000.ANG., vol. av. particle size of 1-200 .mu.m, BET surface area  
 of 20-200m2/g, and an attrition resistance of >90% is used in the prodn.

of hydrogen peroxide by anthraquinone process. The quinone consumption is reduced and the rate of catalyst deactivation is slowed,.

IT 7722-84-1P, Hydrogen peroxide, preparation  
RL: IMF (Industrial manufacture); PREP (Preparation)  
(hydrogenation catalyst comprising palladium on a support for hydrogen peroxide manuf. by anthraquinone process)  
RN 7722-84-1 CAPLUS  
CN Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO-OH

IC ICM C01B015-023  
CC 49-8 (Industrial Inorganic Chemicals)  
ST hydrogen peroxide manuf palladium catalyst;  
oxide support palladium catalyst  
IT 1344-28-1, Alumina, uses  
RL: TEM (Technical or engineered material use); USES (Uses)  
(catalyst support; hydrogenation catalyst comprising palladium on a support for hydrogen peroxide manuf. by anthraquinone process)  
IT 7440-05-3, Palladium, uses  
RL: CAT (Catalyst use); USES (Uses)  
(catalyst; hydrogenation catalyst comprising palladium on a support for hydrogen peroxide manuf. by anthraquinone process)  
IT 7722-84-1P, Hydrogen peroxide, preparation  
RL: IMF (Industrial manufacture); PREP (Preparation)  
(hydrogenation catalyst comprising palladium on a support for hydrogen peroxide manuf. by anthraquinone process)  
IT 1333-74-0, Hydrogen, reactions 2349-70-4, 2-Ethyl-hydroquinone  
4197-69-7, 2-Butyl-hydroquinone 4693-32-7, 2-Pentyl-hydroquinone  
RL: RCT (Reactant); TEM (Technical or engineered material use);  
RACT (Reactant or reagent); USES (Uses)  
(hydrogenation catalyst comprising palladium on a support for hydrogen peroxide manuf. by anthraquinone process)

L25 ANSWER 12 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1996:314998 CAPLUS

DOCUMENT NUMBER: 124:347425

TITLE: Technology for production of hydrogen peroxide by the anthraquinone process

AUTHOR(S): You, Xiande

CORPORATE SOURCE: Liming Inst. Chem. Technol., Ministry Chem. technol.,  
Luoyang, Peop. Rep. China

SOURCE: Huafei Gongye (1996), 23(2), 54-55

KOROMA EIC1700



CODEN: HUGOFO; ISSN: 1006-7779

PUBLISHER: Huafei Gongye Bianjibu

DOCUMENT TYPE: Journal

LANGUAGE: Chinese

AB The industrial process and safety measures for prodn. of .gtoreq.27.5 and .gtoreq.50 % H2O2 products by catalytic hydrogenation of 2-Et anthraquinone in a solvent mixt. of trioctyl phosphate and C10-11 Me benzene derivs., followed by oxidn. of hydroanthraquinone product, is described.

IT 7722-84-1P, Hydrogen peroxide, preparation

RL: IMF (Industrial manufacture); PREP (Preparation)  
(technol. for prodn. of hydrogen peroxide by the anthraquinone process)

RN 7722-84-1 CAPLUS

CN Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO-OH

CC 49-8 (Industrial Inorganic Chemicals)

Section cross-reference(s): 59

ST hydrogen peroxide manuf Et anthraquinone

hydrogenation; safety hydrogen peroxide manuf Et anthraquinone

IT Hydrogenation catalysts

(Pd; in prodn. of hydrogen peroxide by the anthraquinone process)

IT Aromatic hydrocarbons, uses

RL: NUU (Other use, unclassified); USES (Uses)

(Me, C10-11 derivs., solvent; technol. for prodn. of hydrogen peroxide by the anthraquinone process in)

IT Safety

(occupational, in prodn. of hydrogen peroxide by the anthraquinone process)

IT 7440-05-3, Palladium, uses

RL: CAT (Catalyst use); USES (Uses)

(hydrogenation; in prodn. of hydrogen peroxide by the anthraquinone process)

IT 1806-54-8, Trioctyl phosphate

RL: NUU (Other use, unclassified); USES (Uses)

(solvent; technol. for prodn. of hydrogen peroxide by the anthraquinone process in)

IT 7722-84-1P, Hydrogen peroxide, preparation

RL: IMF (Industrial manufacture); PREP (Preparation)  
(technol. for prodn. of hydrogen peroxide by the anthraquinone process)

IT 84-51-5, 2-Ethyl anthraquinone

RL: NUU (Other use, unclassified); RCT (Reactant); TEM

(Technical or engineered material use); RACT (Reactant or reagent)  
; USES (Uses)

(technol. for prodn. of hydrogen peroxide by the

( anthraquinone process with)

L25 ANSWER 13 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1996:110365 CAPLUS

DOCUMENT NUMBER: 124:150081

TITLE: Separation of **catalyst-free** working solutions from the hydrogenation cycle of the **anthraquinone** process for the manufacture of **hydrogen peroxide**

INVENTOR(S): Birkenbeil, Hans; Brand, Ulrich; Goor, Gustaaf; Kunkel, Wolfgang

PATENT ASSIGNEE(S): Degussa AG, Germany

SOURCE: Ger. Offen., 6 pp.

CODEN: GWXXBX

DOCUMENT TYPE: Patent

LANGUAGE: German

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
DE 4418931	A1	19951207	DE 1994-4418931	19940531
DE 4418931	C2	19970619		
US 5534149	A	19960709	US 1995-406519	19950320
EP 687649	A1	19951220	EP 1995-107071	19950510
EP 687649	B1	19980114		
R: AT, BE, DE, DK, ES, FR, GB, IT, NL, SE				
AT 162158	E	19980115	AT 1995-107071	19950510
ES 2113692	T3	19980501	ES 1995-107071	19950510
JP 07330311	A2	19951219	JP 1995-123866	19950523
CA 2150492	AA	19951201	CA 1995-2150492	19950530
CA 2150492	C	20010116		
FI 9502631	A	19951201	FI 1995-2631	19950530
ZA 9504428	A	19960124	ZA 1995-4428	19950530
CN 1122726	A	19960522	CN 1995-106619	19950530
BR 9502610	A	19960102	BR 1995-2610	19950531

PRIORITY APPLN. INFO.: DE 1994-4418931 A 19940531

AB In this process, in which a noble metal-black-contg. working soln. is filtered through a cartridge filter that is periodically back-flushed with catalyst-free soln., the cartridge filters used are open-pore C-, metal-, or ceramic-based supports having av. diam. 5-100 .mu.m provided on one side with a single- or multilayer-membrane having av. pore diam. 1-10 .mu.m. The support materials are selected from Al<sub>2</sub>O<sub>3</sub> and SiC, and the membrane consists of .alpha.-Al<sub>2</sub>O<sub>3</sub>, SiO<sub>2</sub>, or Al<sub>2</sub>O<sub>3</sub>-contg. mixed oxides or ZrO<sub>2</sub>. The catalyst is Pd-black.

IT 7722-84-1P, Hydrogen peroxide, preparation

RL: IMF (Industrial manufacture); PREP (Preparation)

(sepn. of catalyst-free working solns. from the hydrogenation cycle of the anthraquinone process for the manuf. of hydrogen peroxide)

RN 7722-84-1 CAPLUS

CN Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) (9CI) (CA INDEX NAME)

HO-OH

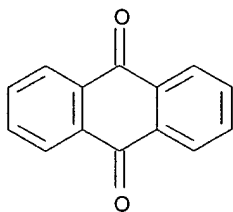
IT 84-65-1, Anthraquinone

RL: PEP (Physical, engineering or chemical process); PROC  
(Process)

(sepn. of catalyst-free working solns. from the  
hydrogenation cycle of the anthraquinone process for  
the manuf. of hydrogen peroxide)

RN 84-65-1 CAPLUS

CN 9,10-Anthracenedione (9CI) (CA INDEX NAME)



IC ICM C01B015-023

ICS B01D029-33

ICA B01J023-44

CC 49-8 (Industrial Inorganic Chemicals)

ST catalyst filtration anthraquinone hydrogen  
peroxide; palladium black catalyst filtration; cartridge  
filter membrane catalyst filtration; alumina cartridge filter;  
silicon carbide cartridge filter; silica alumina zirconia oxide membrane

IT Metals, uses

RL: TEM (Technical or engineered material use); USES (Uses)  
(porous, cartridge filter supports; sepn. of catalyst-free  
working solns. from the hydrogenation cycle of the  
anthraquinone process for the manuf. of hydrogen  
peroxide)

IT Catalysts and Catalysis

Membranes

(sepn. of catalyst-free working solns. from the  
hydrogenation cycle of the anthraquinone process for  
the manuf. of hydrogen peroxide)

IT Filters and Filtering materials

(cartridge, sepn. of catalyst-free working solns. from the  
hydrogenation cycle of the anthraquinone process for  
the manuf. of hydrogen peroxide)

IT Ceramic materials and wares

(porous, sepn. of catalyst-free working solns. from the  
hydrogenation cycle of the anthraquinone process for  
the manuf. of hydrogen peroxide)

IT Oxides, uses

- RL: TEM (Technical or engineered material use); USES (Uses)  
(solid solns., alumina-contg., membranes; sepn. of **catalyst**-free working solns. from the **hydrogenation** cycle of the **anthraquinone** process for the manuf. of **hydrogen peroxide**)
- IT 7440-05-3, Palladium, uses  
RL: CAT (Catalyst use); USES (Uses)  
(black; sepn. of **catalyst**-free working solns. from the **hydrogenation** cycle of the **anthraquinone** process for the manuf. of **hydrogen peroxide**)
- IT 1314-23-4, Zirconia, uses  
RL: TEM (Technical or engineered material use); USES (Uses)  
(membranes; sepn. of **catalyst**-free working solns. from the **hydrogenation** cycle of the **anthraquinone** process for the manuf. of **hydrogen peroxide**)
- IT 409-21-2, Silicon carbide, uses 1344-28-1, Alumina, uses 7440-44-0, Carbon, uses  
RL: TEM (Technical or engineered material use); USES (Uses)  
(porous, cartridge filter supports; sepn. of **catalyst**-free working solns. from the **hydrogenation** cycle of the **anthraquinone** process for the manuf. of **hydrogen peroxide**)
- IT 7722-84-1P, Hydrogen peroxide, preparation  
RL: IMF (Industrial manufacture); PREP (Preparation)  
(sepn. of **catalyst**-free working solns. from the **hydrogenation** cycle of the **anthraquinone** process for the manuf. of **hydrogen peroxide**)
- IT 84-65-1; Anthraquinone  
RL: PEP (Physical, engineering or chemical process); PROC (Process)  
(sepn. of **catalyst**-free working solns. from the **hydrogenation** cycle of the **anthraquinone** process for the manuf. of **hydrogen peroxide**)

L25 ANSWER 14 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1993:563514 CAPLUS  
DOCUMENT NUMBER: 119:163514  
TITLE: Manufacture of hydrogen peroxide  
INVENTOR(S): Deremince, Veronique; Vogels, Claude  
PATENT ASSIGNEE(S): Interlox International S. A., Belg.  
SOURCE: Eur. Pat. Appl., 7 pp.  
CODEN: EPXXDW  
DOCUMENT TYPE: Patent  
LANGUAGE: French  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 546616	A1	19930616	EP 1992-203733	19921203
EP 546616	B1	19961002		

R: AT, BE, CH, DE, ES, FR, GB, IT, LI, NL, PT, SE

BE 1006352	A6	19940802	BE 1991-1132	19911212
AU 9229846	A1	19930617	AU 1992-29846	19921203
AU 649577	B2	19940526		
AT 143650	E	19961015	AT 1992-203733	19921203
ES 2095393	T3	19970216	ES 1992-203733	19921203
CA 2084712	AA	19930613	CA 1992-2084712	19921207
BR 9204989	A	19930615	BR 1992-4989	19921211
JP 05238703	A2	19930917	JP 1992-332935	19921214
US 5342603	A	19940830	US 1992-990198	19921214

## PRIORITY APPLN. INFO.:

BE 1991-1132 19911212

AB In the 3-stage process, comprising hydrogenating a org. soln. of alkylanthraquinones and/or tetrahydroalkylanthraquinones in the presence of an Al<sub>2</sub>O<sub>3</sub>-supported Pd catalyst, oxidizing the soln., and extg. the resulting H<sub>2</sub>O<sub>2</sub> with water, the catalyst is halogenated prior to the fixation of Pd. The catalysts are manufd. by mixing powd. Al<sub>2</sub>O<sub>3</sub> with an amt. of NH<sub>4</sub> halide sufficient to give a halogen content of 0.2-15 wt.%, calcining the mixt in inert atm., allowing the halogenated Al<sub>2</sub>O<sub>3</sub> to cool, dispersing the halogenated Al<sub>2</sub>O<sub>3</sub> in an aq. soln. of a Pd salt, pptg. Pd on the halogenated Al<sub>2</sub>O<sub>3</sub> while progressively increasing the pH of the soln. to a weakly alk. value, and sepg. and drying the catalyst. The catalysts suppress undesirable hydrogenation reactions and formation of oxanthrone. Al<sub>2</sub>O<sub>3</sub> was fluoridated with NH<sub>4</sub>F and impregnated with a PdCl<sub>2</sub> soln. in HCl under addn. of NaOH. The hydrogenation of an alkylanthraquinone mixt. was carried out in Solvesso 150. The oxanthrone/anthraquinone ratio was 0.050, vs. 0.320 for an unhalogenated catalyst.

IT 7722-84-1P, Hydrogen peroxide, preparation

RL: IMF (Industrial manufacture); PREP (Preparation)

(manuf. of, by anthraquinone process, halogenated alumina-supported palladium catalysts for, for decreased oxanthrone formation)

RN 7722-84-1 CAPLUS

CN Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) (9CI) (CA INDEX NAME)

HO-OH

IC ICM C01B015-023

ICS B01J037-22

CC 49-8 (Industrial Inorganic Chemicals)

ST hydrogenation oxidn hydrogen peroxide;  
alkylanthraquinone tetrahydroalkylanthraquinone hydrogenation oxidn;  
palladium hydrogenation catalyst; halogenated alumina  
catalyst support; fluoridated alumina catalyst support

IT Alkali metals, uses

Alkaline earth metals

RL: USES (Uses)

(alumina doped with, halogenation of, for supports for palladium  
hydrogenation catalysts in hydrogen  
peroxide manuf. by anthraquinone process, for

- decreased oxanthrone formation)
- IT Ammonium halides  
RL: USES (Uses)  
(halogenation with, of alumina, for supports for palladium  
hydrogenation catalysts in hydrogen  
peroxide manuf. by anthraquinone process, for  
decreased oxanthrone formation)
- IT Bromination  
Chlorination  
Fluorination  
Halogenation  
(of alumina, for supports for palladium hydrogenation  
catalysts in hydrogen peroxide manuf. by  
anthraquinone process, for decreased oxanthrone formation)
- IT Hydrogenation catalysts  
(palladium/halogenated alumina, for decreased oxanthrone formation in  
hydrogen peroxide manuf. by anthraquinone  
process)
- IT 56854-76-3 74893-67-7 149996-16-7 149996-17-8 149996-18-9  
RL: USES (Uses)  
(alkylanthraquinone mixts. contg., hydrogenation  
of, in hydrogen peroxide manuf., catalysts  
for, for decreased oxanthrone formation)
- IT 11098-99-0P, Molybdenum oxide 11118-57-3P, Chromium oxide  
RL: PREP (Preparation)  
(alumina impregnated with, halogenation of, for supports for palladium  
hydrogenation catalysts in hydrogen  
peroxide manuf. by anthraquinone process, for  
decreased oxanthrone formation)
- IT 1332-37-2P, Iron oxide, reactions  
RL: RCT (Reactant); PREP (Preparation); RACT  
(Reactant or reagent)  
(alumina impregnated with, halogenation of, for supports for palladium  
hydrogenation catalysts in hydrogen  
peroxide manuf. by anthraquinone process, for  
decreased oxanthrone formation)
- IT 7726-95-6P  
RL: PREP (Preparation)  
(bromination, of alumina, for supports for palladium  
hydrogenation catalysts in hydrogen  
peroxide manuf. by anthraquinone process, for  
decreased oxanthrone formation)
- IT 7782-41-4P  
RL: PREP (Preparation)  
(fluorination, of alumina, for supports for palladium  
hydrogenation catalysts in hydrogen  
peroxide manuf. by anthraquinone process, for  
decreased oxanthrone formation)
- IT 1344-28-1, Alumina, reactions  
RL: RCT (Reactant); RACT (Reactant or reagent)  
(halogenation of, for supports for palladium hydrogenation  
catalysts in hydrogen peroxide manuf. by

- anthraquinone process, for decreased oxanthrone formation)**
- IT 12125-01-8P, Ammonium fluoride  
 RL: PREP (Preparation)  
 (halogenation with, of alumina, for supports for palladium  
**hydrogenation catalysts in hydrogen**  
**peroxide manuf. by anthraquinone process, for**  
 decreased oxanthrone formation)
- IT 7440-05-3, Palladium, uses  
 RL: CAT (Catalyst use); USES (Uses)  
 (hydrogenation catalysts, on halogenated  
 alumina-supports, for decreased oxanthrone formation in  
**hydrogen peroxide manuf. by anthraquinone**  
 process)
- IT 7722-84-1P, Hydrogen peroxide, preparation  
 RL: IMF (Industrial manufacture); PREP (Preparation)  
 (manuf. of, by anthraquinone process, halogenated  
 alumina-supported palladium catalysts for, for decreased  
 oxanthrone formation)
- IT 7647-10-1, Palladium chloride  
 RL: USES (Uses)  
 (palladium pptn. from, on halogenated alumina supports, for  
**hydrogenation catalysts in hydrogen**  
**peroxide manuf. by anthraquinone process, for**  
 decreased oxanthrone formation)

L25 ANSWER 15 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1992:41114 CAPLUS

DOCUMENT NUMBER: 116:41114

TITLE: Process for the production of  
 alkyltetrahydroanthrahydroquinones and use of their  
 solutions in **hydrogen peroxide**  
 manufacture

INVENTOR(S): Simon, Dietolf; Woost, Otmar

PATENT ASSIGNEE(S): Peroxid-Chemie G.m.b.H., Germany

SOURCE: Eur. Pat. Appl., 7 pp.

CODEN: EPXXDW

DOCUMENT TYPE: Patent

LANGUAGE: German

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 453949	A1	19911030	EP 1991-106173	19910418
EP 453949	B1	19940907		
R: AT, BE, CH, DE, ES, FR, GB, IT, LI, NL, SE				
DE 4013090	A1	19911031	DE 1990-4013090	19900425
FI 9101023	A	19911026	FI 1991-1023	19910228
JP 04224538	A2	19920813	JP 1991-79007	19910411
HU 57696	A2	19911230	HU 1991-1261	19910417
HU 206305	B	19921028		
ES 2061104	T3	19941201	ES 1991-106173	19910418

CA 2041159	AA	19911026	CA 1991-2041159	19910424
AU 9175305	A1	19911107	AU 1991-75305	19910424
AU 630289	B2	19921022		
BR 9101644	A	19911210	BR 1991-1644	19910424
US 5147628	A	19920915	US 1991-690615	19910424
PL 165672	B1	19950131	PL 1991-290010	19910424
RU 2066308	C1	19960910	RU 1991-4895122	19910424

PRIORITY APPLN. INFO.:

DE 1990-4013090

19900425

OTHER SOURCE(S):

CASREACT 116:41114

AB A process for the prepn. of alkyltetrahydroanthrahydroquinone-contg. products comprises the heterogeneously **catalyzed** hydrogenation of alkylanthraquinone. The educts are treated over a suspension **catalyst** or carrier-supported suspension **catalyst** to give a soln. which is directly suitable for the prepn. of H<sub>2</sub>O<sub>2</sub> in the **anthraquinone** process. Further isolation of alkyltetrahydroanthrahydroquinone for the prepn. of H<sub>2</sub>O<sub>2</sub> is not required. The hydrogenation of 2-amylanthraquinone was carried out in a loop reactor charged with a heterogeneous **mixt.** contg. 2-amylanthraquinone (**mixt.** of sec- and tert-amylanthraquinone) (100 g/kg), Raney nickel (1% suspension), and diisobutyl carbinol (270 g/kg) and C<sub>10</sub>-alkylarenes (630 g/kg) as solvents. The selectivity toward formation of 5,6,7,8-tetrahydroanthrahydroquinone was 94.5%.

IT 7722-84-1P, **Hydrogen peroxide** (H<sub>2</sub>O<sub>2</sub>),  
preparation

RL: **PREP** (Preparation)

(alkyltetrahydroanthrahydroquinone-contg. soln. for)

RN 7722-84-1 CAPLUS

CN Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) (9CI) (CA INDEX NAME)

HO-OH

IC ICM C07C039-17

ICS C07C050-16; C01B015-023

CC 25-27 (Benzene, Its Derivatives, and Condensed Benzenoid Compounds)

ST hydrogenation alkylanthraquinone; anthrahydroquinone alkyltetrahydro;  
**hydrogen peroxide** manuf alkyltetrahydroanthrahydroquinon  
e soln; anthracenediol alkyltetrahydro

IT Aromatic hydrocarbons, uses

(C<sub>10</sub>-alkyl, solvent for **hydrogenation** of alkylanthraquinone  
to alkyltetrahydroanthrahydroquinone-contg. soln. for **hydrogen**  
**peroxide** manuf.)

IT 7722-84-1P, **Hydrogen peroxide** (H<sub>2</sub>O<sub>2</sub>),  
preparation

RL: **PREP** (Preparation)

(alkyltetrahydroanthrahydroquinone-contg. soln. for)

IT 84-51-5, 2-Ethylanthraquinone 7504-51-0, 2-Butylanthraquinone  
13936-21-5, 2-Amylanthraquinone 32588-54-8, 2-tert-Amylanthraquinone  
75931-61-2, 2-sec-Amylanthraquinone

RL: **RCT** (Reactant); **RACT** (Reactant or reagent)

(hydrogenation of, alkyltetrahydroanthrahydroquinone-contg.)



soln. for hydrogen peroxide manuf. from)  
 IT 15547-17-8P 63592-76-7DP, alkyl derivs. 83875-84-7P 100647-24-3P  
 RL: SPN (Synthetic preparation); PREP (Preparation)  
 (prepn. of, by hydrogenation of alkylanthraquinone, soln. for  
 hydrogen peroxide manuf. from)  
 IT 108-82-7, Diisobutyl carbinol 5726-19-2  
 RL: RCT (Reactant); RACT (Reactant or reagent)  
 (solvent, for hydrogenation of alkylanthraquinone to  
 alkyltetrahydroanthrahydroquinone-contg. soln. for hydrogen  
 peroxide manuf. from)

L25 ANSWER 16 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1991:9149 CAPLUS

DOCUMENT NUMBER: 114:9149

TITLE: Static mixer for the manufacture of  
 hydrogen peroxide by the  
 anthraquinone process

INVENTOR(S): Maunula, Teuvo; Mustonen, Eva Liisa; Turunen, Ilkka;  
 Virta, Pirkko

PATENT ASSIGNEE(S): Kemira Oy, Finland

SOURCE: Fr. Demande, 15 pp.

CODEN: FRXXBL

DOCUMENT TYPE: Patent

LANGUAGE: French

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
FR 2642412	A1	19900803	FR 1990-986	19900129
FR 2642412	B1	19921113		
FI 8900428	A	19900728	FI 1989-428	19890127
FI 82669	B	19901231		
FI 82669	C	19910410		
SE 9000227	A	19900728	SE 1990-227	19900123
SE 504578	C2	19970310		
AU 9048660	A1	19900802	AU 1990-48660	19900123
AU 620963	B2	19920227		
CA 2008651	AA	19900727	CA 1990-2008651	19900126
DE 4002335	A1	19900906	DE 1990-4002335	19900126
GB 2229173	A1	19900919	GB 1990-1802	19900126
GB 2229173	B2	19930303		
JP 02275703	A2	19901109	JP 1990-15146	19900126
BR 9000347	A	19901204	BR 1990-347	19900126
ES 2019046	A6	19910516	ES 1990-488	19900126
PRIORITY APPLN. INFO.:			FI 1989-428	19890127

AB The process comprises circulating the reaction mixt. through a  
 catalyst-coated static mixer. The reaction mixt  
 contains an anthraquinone deriv. and H, and  
 unreacted H from the product is recirculated to the feed mixt.  
 The static mixer segments are coated with a porous support  
 having thickness .ltoreq.300 .mu.m, in which a hydrogenation

catalyst is absorbed. A soln. of Ethyl-2-anthraquinone (100 g/L) in a mixt. of arom. hydrocarbons and org. P compds. was circulated through a Pd-coated static mixer, together with H at 55 L/h. The av. yield of H<sub>2</sub>O<sub>2</sub> was 50 kg/kg Pd-h.

IT 7722-84-1P, Hydrogen peroxide, preparation  
 RL: IMF (Industrial manufacture); PREP (Preparation)  
 (manuf. of, by anthraquinone process, catalyst  
 -coated mixer in)  
 RN 7722-84-1 CAPLUS  
 CN Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) (9CI) (CA INDEX NAME)

HO-OH

IC ICM C01B015-023  
 ICS B01J010-00  
 CC 49-8 (Industrial Inorganic Chemicals)  
 ST catalyst coating static mixer; anthraquinone  
catalytic hydrogenation static mixer; hydrogen  
peroxide manuf anthraquinone  
 IT Silicates, uses and miscellaneous  
 RL: USES (Uses)  
 (supports, catalyst, in hydrogen peroxide  
 manuf. from hydroquinone)  
 IT Mixing apparatus  
 (static, catalyst-coated, for hydrogenation of  
 anthraquinone derivs., in hydrogen  
 peroxide manuf.)  
 IT 7440-02-0, Nickel, uses and miscellaneous 7440-05-3, Palladium, uses and  
 miscellaneous 7440-06-4, Platinum, uses and miscellaneous 7440-16-6,  
 Rhodium, uses and miscellaneous  
 RL: CAT (Catalyst use); USES (Uses)  
 (hydrogenation catalyst, static mixers  
 coated with porous, in hydrogen peroxide manuf.)  
 IT 84-51-5, Ethyl-2-anthraquinone  
 RL: RCT (Reactant); RACT (Reactant or reagent)  
 (hydrogenation of, catalytic, for hydrogen  
 peroxide manuf.)  
 IT 1333-74-0, Hydrogen, reactions  
 RL: RCT (Reactant); RACT (Reactant or reagent)  
 (hydrogenation with, catalytic, of  
 anthraquinone derivs., in catalyst-coated  
 static mixer, for hydrogen peroxide)  
 IT 7722-84-1P, Hydrogen peroxide, preparation  
 RL: IMF (Industrial manufacture); PREP (Preparation)  
 (manuf. of, by anthraquinone process, catalyst  
 -coated mixer in)  
 IT 1344-28-1, Alumina, uses and miscellaneous  
 RL: USES (Uses)  
 (supports, catalyst, static mixers coated with, for  
 hydrogen peroxide manuf.)

IT 7440-44-0, Carbon, uses and miscellaneous 7631-86-9, Silica, uses and miscellaneous  
RL: USES (Uses)  
(supports, catalyst, static mixers coated with, in hydrogen peroxide manuf.)

L25 ANSWER 17 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1990:594427 CAPLUS

DOCUMENT NUMBER: 113:194427

TITLE: Method and tubular catalytic hydrogenation reactor for the manufacture of hydrogen peroxide by the anthraquinone process

INVENTOR(S): Manula, Teuvo; Mustonen, Eva Liisa; Turunen, Ilkka; Virta, Pirkko

PATENT ASSIGNEE(S): Kemira Oy, Finland

SOURCE: Ger. Offen., 6 pp.

CODEN: GWXXBX

DOCUMENT TYPE: Patent

LANGUAGE: German

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
DE 4002350	A1	19900823	DE 1990-4002350	19900126
FI 8900429	A	19900728	FI 1989-429	19890127
FI 82670	B	19901231		
FI 82670	C	19910410		
SE 9000228	A	19900728	SE 1990-228	19900123
SE 503026	C2	19960311		
AU 9048659	A1	19900802	AU 1990-48659	19900123
AU 627827	B2	19920903		
US 5071634	A	19911210	US 1990-469281	19900124
CA 2008656	AA	19900727	CA 1990-2008656	19900126
GB 2229431	A1	19900926	GB 1990-1801	19900126
GB 2229431	B2	19930224		
JP 02275704	A2	19901109	JP 1990-15147	19900126
BR 9000348	A	19901204	BR 1990-348	19900126
ES 2019045	A6	19910516	ES 1990-487	19900126
FR 2642413	A1	19900803	FR 1990-987	19900129
FR 2642413	B1	19930521		

PRIORITY APPLN. INFO.: FI 1989-429 19890127

AB The title process comprises recirculating a reaction mixt. of H<sub>2</sub> or a H-contg. gas, and a working soln., i.e., an anthraquinone deriv. in an org. solvent, through a long multistage static mixing zone contg. alternating mixing and catalytic stages to hydrogenate the anthraquinone deriv. in the presence of a solid catalyst, and removing the hydrogenated working soln. and gas from the recirculating mixt. The linear velocity of the mixt. through the tubular mixer-reactor is 0.3-1.0 m/s at 1-15 bar, preferably 2-5 bar, and

<100.degree., preferably 40-60.degree..  
\* IT 7722-84-1P, Hydrogen peroxide (H2O2),  
preparation  
RL: IMF (Industrial manufacture); PREP (Preparation)  
(manuf. of, by anthraquinone process, tubular reactor with  
alternating static mixing and catalytic  
hydrogenation stages for)  
RN 7722-84-1 CAPLUS  
CN Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO-OH

IC ICM C01B015-023  
ICS B01J008-06; B01F005-02  
ICA B01J035-04; B01J023-40; B01J023-74; B01J023-89  
CC 49-8 (Industrial Inorganic Chemicals)  
ST anthraquinone deriv hydrogenation hydrogen  
peroxide; static mixer catalytic tubular  
reactor  
IT Silicates, uses and miscellaneous  
RL: CAT (Catalyst use); USES (Uses)  
(catalyst support, in tubular reactor contg. alternating  
mixing and catalytic hydrogenation stages,  
for hydrogen peroxide manuf. by  
anthraquinone process)  
IT Reactors  
(multistage, catalytic, tubular, with static mixers  
, for hydrogen peroxide manuf. by  
anthraquinone process)  
IT Mixing apparatus  
(static, reactors contg. alternating catalytic  
hydrogenation stages and, multistage tubular, for  
hydrogen peroxide manuf. by anthraquinone  
process)  
IT Catalysts and Catalysis  
(supports, honeycomb, in tubular reactor contg. alternating static  
mixing and catalytic hydrogenation stages,  
for hydrogen peroxide manuf. by  
anthraquinone process)  
IT 7440-44-0, Carbon, uses and miscellaneous  
RL: CAT (Catalyst use); USES (Uses)  
(catalyst support, in tubular reactor contg. alternating  
mixing and catalytic hydrogenation stages,  
for hydrogen peroxide manuf. by  
anthraquinone process)  
IT 7440-02-0P, Nickel, uses and miscellaneous 7440-05-3P, Palladium, uses  
and miscellaneous 7440-06-4P, Platinum, uses and miscellaneous  
7440-16-6P, Rhodium, uses and miscellaneous  
RL: CAT (Catalyst use); PREP (Preparation); USES (Uses)  
(hydrogenation catalyst, multistage tubular reactor

contg. alternating static mixing stages and, for  
hydrogen peroxide manuf. by anthraquinone  
process)

IT 7722-84-1P, Hydrogen peroxide (H2O2),  
preparation

RL: IMF (Industrial manufacture); PREP (Preparation)  
(manuf. of, by anthraquinone process, tubular reactor with  
alternating static mixing and catalytic  
hydrogenation stages for)

IT 84-51-5, 2-Ethylanthraquinone

RL: USES (Uses)  
(working soln., in hydrogen peroxide manuf. in  
multistage tubular reactors contg. alternating static mixing  
and catalytic hydrogenation stages)

L25 ANSWER 18 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1989:536991 CAPLUS

DOCUMENT NUMBER: 111:136991

TITLE: Fixed-bed, alumina-supported hydrogenation  
catalysts for the manufacture of  
hydrogen peroxide from quinones

INVENTOR(S): Jenkins, Colie L.

PATENT ASSIGNEE(S): du Pont de Nemours, E. I., and Co., USA

SOURCE: U.S., 6 pp.

CODEN: USXXAM

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 4800075	A	19890124	US 1987-132475	19871214
CA 1303819	A1	19920623	CA 1988-585767	19881213

PRIORITY APPLN. INFO.: US 1987-132475 19871214

AB In the title process, involving (a) hydrogenating a working soln.  
comprising quinones dissolved in solvents in the presence of a  
hydrogenation catalyst, (b) oxidizing the hydrogenated soln.,  
(c) sepg. the H2O2 from the working soln., and (d) recycling the working  
soln. for further hydrogenation, the hydrogenation catalyst  
comprises Pd deposited on a support contg. 5-99% .alpha.-Al2O3, and the  
sp. surface area of the catalyst is 108 to 5 m2/g. Pt may be  
admixed with the Pd; based on the catalyst wt., the Pd content  
is 0.1-3% and the Pt content is >0.01%. These catalysts retain  
their metal compn. and have very low adsorption of acidic products. They  
retain their activity and selectivity for com. serviceable times and are  
also more resistant to concns. of H2O2 that cause deactivation. Using a  
working soln. consisting of a mixt. of 2-Bu- and 2-amyl-  
anthraquinones and their corresponding tetrahydroanthraquinones in  
a mixed solvent (Arom. 150) and diisobutyl carbinol, and a  
catalyst consisting of 0.283 wt.% Pd on 72% .alpha.-Al2O3 having  
surface area 39 m2/g, a cyclic unit was operated for 280 h at an av. H2O2

concn. in the feed to the hydrogenator of 286 mg/L. The hydroquinone prodn. remained steady at 0.388 gmol/L, and no quinone loss or anthrone prodn. occurred. The (CO<sub>2</sub>H)<sub>2</sub> content of the catalyst after 280 h was 545 ppm.

IT 7722-84-1P, Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>),  
preparation

RL: IMF (Industrial manufacture); PREP (Preparation)  
(manuf. of, by quinone process, .alpha.-alumina-supported fixed-bed  
hydrogenation catalysts for, for activity and  
selectivity)

RN 7722-84-1 CAPLUS

CN Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) (9CI) (CA INDEX NAME)

HO-OH

IC ICM C01B015-02

NCL 423588000

CC 49-8 (Industrial Inorganic Chemicals)

Section cross-reference(s): 67

ST anthraquinone hydrogenation catalyst hydrogen  
peroxide; palladium alumina hydrogenation catalyst;  
platinum alumina hydrogenation catalyst

IT Hydrogenation catalysts

(fixed-bed, .alpha.-alumina-supported, in hydrogen  
peroxide manuf. by quinone process, for activity and  
selectivity)

IT 7440-06-4, Platinum, uses and miscellaneous

RL: USES (Uses)

(catalyst contg. palladium and, on .alpha.-alumina, for  
fixed-bed quinone hydrogenation, for hydrogen  
peroxide)

IT 7440-05-3, Palladium, uses and miscellaneous

RL: CAT (Catalyst use); USES (Uses)

(catalysts, on .alpha.-alumina, for fixed-bed quinone  
hydrogenation, for hydrogen peroxide)

IT 109634-59-5P 122705-51-5P

RL: FORM (Formation, nonpreparative); PREP (Preparation)

(formation of, by hydrogenation, .alpha.-alumina-supported  
fixed-bed catalysts for, in hydrogen  
peroxide manuf.)

IT 7504-51-0, 2-Butyl-anthraquinone 13936-21-5, 2-Amyl-  
anthraquinone

RL: RCT (Reactant); RACT (Reactant or reagent)

(hydrogenation of, .alpha.-alumina-supported fixed-bed  
catalysts for, in hydrogen peroxide manuf.)

IT 7722-84-1P, Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>),  
preparation

RL: IMF (Industrial manufacture); PREP (Preparation)

(manuf. of, by quinone process, .alpha.-alumina-supported fixed-bed  
hydrogenation catalysts for, for activity and

selectivity)

L25 ANSWER 19 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1989:117726 CAPLUS

DOCUMENT NUMBER: 110:117726

TITLE: Preparation of hydrogen peroxide  
by reduction and oxidation of anthraquinones

INVENTOR(S): Bengtsson, Erik Alvar; Andersson, Ulf Mikael

PATENT ASSIGNEE(S): Eka Nobel AB, Swed.

SOURCE: Eur. Pat. Appl., 6 pp.

CODEN: EPXXDW

DOCUMENT TYPE: Patent

LANGUAGE: English

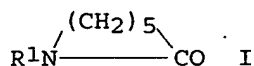
FAMILY ACC. NUM. COUNT: 2

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 286610	A2	19881012	EP 1988-850082	19880309
EP 286610	A3	19890726		
EP 286610	B1	19920527		
R: AT, BE, DE, FR, GB, IT, SE				
SE 8701293	A	19880928	SE 1987-1293	19870327
SE 459919	B	19890821		
SE 459919	C	19910103		
AT 76624	E	19920615	AT 1988-850082	19880309
US 4800073	A	19890124	US 1988-171106	19880321
US 4800074	A	19890124	US 1988-171107	19880321
FI 8801377	A	19880928	FI 1988-1377	19880323
FI 86539	B	19920529		
FI 86539	C	19920910		
FI 8801378	A	19880928	FI 1988-1378	19880323
FI 86540	B	19920529		
FI 86540	C	19920910		
CA 1295808	A1	19920218	CA 1988-562284	19880324
NO 8801350	A	19880928	NO 1988-1350	19880325
NO 170072	B	19920601		
NO 170072	C	19920909		
NO 8801351	A	19880928	NO 1988-1351	19880325
NO 170073	B	19920601		
NO 170073	C	19920909		
JP 01119503	A2	19890511	JP 1988-69894	19880325
JP 05011042	B4	19930212		
JP 01126210	A2	19890518	JP 1988-69893	19880325
JP 05011041	B4	19930212		
CA 1295809	A1	19920218	CA 1988-562503	19880325
PRIORITY APPLN. INFO.:			SE 1987-1293	19870327
			EP 1988-850082	19880309

OTHER SOURCE(S): MARPAT 110:117726

GI



AB H2O2 is prepd. by redn. and oxidn. of an **anthraquinone** using an alkyl-substituted caprolactam, having the general formula I (R1 = C6-12-alkyl, e.g., octyl) as a solvent. This method provides for better hydroquinone soly., together with a substantial improvement in the distribution coeff. for H2O2 between the aq. phase and the solvent phase. Tetrahydroethylantraquinone (II) (180 g/L) was dissolved in a solvent mixt. consisting of 75% Shellsol AB (C4-alkylbenzene derivs.) and 25% octyl caprolactam, and Raney Ni (28 g/L) was added as the catalyst. The II was 90% hydrogenated, the catalyst was removed, and the soln. oxidized with air to give a soln. contg. H2O2 28 g/L. The H2O2 was extd. with water, and, after drying, the working soln. was recycled to hydrogenation step.

IT 7722-84-1P, Hydrogen peroxide, preparation  
 RL: PREP (Preparation)  
 (prepn. of, from **anthraquinones**, alkyl-substituted caprolactam solvents in)

RN 7722-84-1 CAPLUS

CN Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO-OH

IC ICM C01B015-023

CC 49-8 (Industrial Inorganic Chemicals)

ST **anthraquinone** redn oxidn **hydrogen peroxide**;  
 alkyl substituted caprolactam solvent peroxide; octyl caprolactam solvent  
 Raney nickel; tetrahydroethylantraquinone redn oxidn

IT Solvents  
 (hydrocarbon mixts. with alkyl-substituted caprolactam, in  
 hydrogen peroxide prepn. from **anthraquinones**  
 )

IT Hydrogenation catalysts  
 (in alkylantraquinone redn., for **hydrogen peroxide**  
 , in alkylcaprolactam solvents)

IT Oxidation  
 (of hydrogenated **anthraquinones**, for **hydrogen peroxide**, alkylcaprolactam solvents in)

IT Hydrocarbon oils  
 RL: PREP (Preparation)  
 (arom., solvents contg. alkyl-substituted caprolactam and, in  
 hydrogen peroxide prepn. from **anthraquinones**  
 )

IT 7722-84-1P, Hydrogen peroxide, preparation  
 RL: PREP (Preparation)  
 (prepn. of, from **anthraquinones**, alkyl-substituted caprolactam solvents in)



IT 119429-45-7  
 RL: USES (Uses)  
 (redn. and oxidn. of, for **hydrogen peroxide**,  
 alkyl-substituted caprolactam solvents in)

IT 84-51-5, 2-Ethylantraquinone 68279-54-9  
 RL: USES (Uses)  
 (redn. and oxidn. of, in **hydrogen peroxide** prepn.,  
 soly. in solvent mixts. in relation to)

IT 1333-74-0, Hydrogen, reactions  
 RL: RCT (Reactant); RACT (Reactant or reagent)  
 (redn. by, of anthraquinones, catalytic, for  
**hydrogen peroxide**, alkyl-substituted caprolactam  
 solvents in)

IT 37672-43-8 59227-88-2  
 RL: USES (Uses)  
 (solvents contg. Shellsol AB and, in **hydrogen**  
**peroxide** prepn. from **anthraquinones**)

IT 71-43-2D, Benzene, C4-alkyl derivs.  
 RL: USES (Uses)  
 (solvents contg. alkyl-substituted caprolactam and, in **hydrogen**  
**peroxide** prepn. from **anthraquinones**, Shellsol AB)

L25 ANSWER 20 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1988:531699 CAPLUS

DOCUMENT NUMBER: 109:131699

TITLE: Method for hydrogenation in the preparation of  
**hydrogen peroxide** by  
**anthraquinone** process

PATENT ASSIGNEE(S): Kemira Oy, Finland

SOURCE: Neth. Appl., 10 pp.

CODEN: NAXXAN

DOCUMENT TYPE: Patent

LANGUAGE: Dutch

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

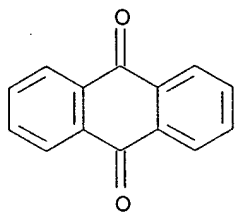
PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
NL 8702882	A	19880701	NL 1987-2882	19871201
FI 8604971	A	19880606	FI 1986-4971	19861205
FI 77633	B	19881230		
IN 170512	A	19920404	IN 1987-MA847	19871124

PRIORITY APPLN. INFO.: FI 1986-4971 19861205

AB A 3-phase reaction mixt. consisting of H or H-contg. gas, a  
 working soln. of **anthraquinone** or its deriv. in an  
 org. solvent, and a solid catalyst in suspension, is  
recirculated in a reactor tube contg. a static mixer. The  
 pressure in the system is <15 bar, the temp. <100.degree., and the linear  
 velocity of the working soln. is <3 m/s. This method provides for  
sufficient mixing, even at low velocities. A 3-L working soln.  
 of 100 g 2-Et-anthraquinone in a mixt. of arom.  
 hydrocarbons and another org. solvent was recirculated through a 10-m-long

tube system contg. a static mixer. The flow rate was 1.79 m3/h, the temp. 50.degree., and the pressure 3.57 bar. The catalyst was metallic Pd in an amt. 0.56 g/L working soln. H was fed at 14.7 g/L resulting in the hydrogenation of 40% and conversion of all H.

IT 84-65-1, Anthraquinone  
 RL: RCT (Reactant); RACT (Reactant or reagent)  
 (hydrogenation of, catalytic, static mixer  
 -reaction tube systems for)  
 RN 84-65-1 CAPLUS  
 CN 9,10-Anthracenedione (9CI) (CA INDEX NAME)



IT 7722-84-1P, Hydrogen peroxide, preparation  
 RL: PREP (Preparation)  
 (prepn. of, catalytic hydrogenation of  
 anthraquinone derivs. in, static mixer  
 -reactor for)  
 RN 7722-84-1 CAPLUS  
 CN Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO-OH

IC ICM C01B015-023  
 CC 49-8 (Industrial Inorganic Chemicals)  
 ST hydrogen peroxide prepn anthraquinone;  
palladium hydrogenation catalyst anthraquinone  
 IT Hydrogenation catalysts  
 (palladium, unsupported, in hydrogen peroxide  
 prepn.)  
 IT Mixing apparatus  
 (static, tubular reaction system contg., for hydrogen  
peroxide prepn.)  
 IT 7440-05-3, Palladium, uses and miscellaneous  
 RL: CAT (Catalyst use); USES (Uses)  
 (hydrogenation catalyst, unsupported, in  
 hydrogen peroxide prepn.)  
 IT 84-51-5, 2-Ethyl anthraquinone 84-65-1,  
 Anthraquinone  
 RL: RCT (Reactant); RACT (Reactant or reagent)  
 (hydrogenation of, catalytic, static mixer  
 -reaction tube systems for)

IT 7722-84-1P, Hydrogen peroxide, preparation

RL: PREP (Preparation)

(prepn. of, catalytic hydrogenation of anthraquinone derivs. in, static mixer-reactor for)

IT 1333-74-0, Hydrogen, reactions

RL: RCT (Reactant); RACT (Reactant or reagent)

(redn. by, catalytic, of anthraquinone, static mixer-reaction tube system for)

125 ANSWER 21 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1988:97276 CAPLUS

DOCUMENT NUMBER: 108:97276

TITLE: Continuous production of hydrogen peroxide

INVENTOR(S): Pueyo Gracia, Ricardo; Ochoa Bendicho, Victor; Lopez Martinez, Jose Maria

PATENT ASSIGNEE(S): Foret S. A., Spain

SOURCE: Span., 10 pp.

CODEN: SPXXAD

DOCUMENT TYPE: Patent

LANGUAGE: Spanish

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
ES 555611	A1	19870701	ES 1986-555611	19860602
PRIORITY APPLN. INFO.:			ES 1986-555611	19860602

AB In the title process consisting of catalytic hydrogenation, filtration, oxidn., and extn. of a soln. of alkylanthraquinones in a mixt. of polar org. and arom. solvents, the working soln. is reactivated with gamma.-Al<sub>2</sub>O<sub>3</sub>, Na aluminosilicate, and a macroporous anionic resin in OH form at 0-100% each at 70-160.degree. with addn. of 2-30% of the total H<sub>2</sub>O<sub>2</sub> product.

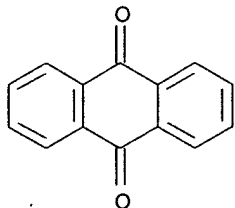
IT 84-65-1D, Anthraquinone, alkyl derivs.

RL: RCT (Reactant); RACT (Reactant or reagent)

(catalytic hydrogenation of, in continuous hydrogen peroxide prodn. with working soln. reactivation for recycling)

RN 84-65-1 CAPLUS

CN 9,10-Anthracenedione (9CI) (CA INDEX NAME)



• IT 7722-84-1P, Hydrogen peroxide, preparation  
RL: PREP (Preparation)  
(continuous prodn. of, with working soln. reactivation for recycling)  
RN 7722-84-1 CAPLUS  
CN Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO-OH

IC ICM C01B015-023  
CC 49-8 (Industrial Inorganic Chemicals)  
ST reactivation working soln peroxide prodn; continuous hydrogen peroxide prodn  
IT Polymers, uses and miscellaneous  
RL: USES (Uses)  
(anionic macroporous, in reactivation of anthraquinone solns. for continuous hydrogen peroxide prodn.)  
IT 84-65-1D, Anthraquinone, alkyl derivs.  
RL: RCT (Reactant); RACT (Reactant or reagent)  
(catalytic hydrogenation of, in continuous hydrogen peroxide prodn. with working soln. reactivation for recycling)  
IT 7722-84-1P, Hydrogen peroxide, preparation  
RL: PREP (Preparation)  
(continuous prodn. of, with working soln. reactivation for recycling)  
IT 1344-00-9, Sodium aluminosilicate 1344-28-1, Alumina, uses and miscellaneous  
RL: USES (Uses)  
(in reactivation of anthraquinone solns. for continuous hydrogen peroxide prodn.)

L25 ANSWER 22 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1987:499249 CAPLUS

DOCUMENT NUMBER: 107:99249

TITLE: Process for manufacturing hydrogen peroxide

INVENTOR(S): Rushmere, John D.

PATENT ASSIGNEE(S): du Pont de Nemours, E. I., and Co., USA

SOURCE: U.S., 4 pp.

CODEN: USXXAM

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 4668499	A	19870526	US 1986-823064	19860127
PRIORITY APPLN. INFO.:			US 1986-823064	19860127
AB			The cyclic anthraquinone process for prepn of H2O2 is improved	

by adding a **catalytic** amt. of amines of formula NR<sub>1</sub>R<sub>2</sub>R<sub>3</sub> (R<sub>1</sub> =aryl, R<sub>1,2</sub> =C1-18 alkyl), with aq. pKa .apprx.4-9. The additive reoxidizes inert quinone-degrdn. species to useful quinones. When a **catalytic** amt. of NBu<sub>2</sub>(C<sub>6</sub>H<sub>4</sub>Me) was added to a reaction **mixt.** in which Bu and amyl **anthraquinones** were cyclically hydrogenated and oxidized, a 13% content of 2-butylanthrone (a degrdn. product) was obsd. after 24 h, vs. 76% when no amine was added.

IT 7722-84-1P, **Hydrogen peroxide**, preparation  
 RL: **PREP (Preparation)**  
 (prepn. of, improved cyclic **anthraquinone** process for)  
 RN 7722-84-1 CAPLUS  
 CN Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) (9CI) (CA INDEX NAME)

HO-OH

IC ICM C01B015-02  
 NCL 423588000  
 CC 49-8 (Industrial Inorganic Chemicals)  
 ST **hydrogen peroxide** prepn **anthraquinone** regeneration  
 IT 91-67-8, N,N-Diethyl-3-methylaniline 606-46-2, N,N-Diethyl-2-methylaniline 613-29-6, N,N-Dibutylaniline 4430-09-5, N,N-Dihexylaniline 31144-33-9, N,N-Dibutyl-4-methylaniline 105336-41-2 109881-20-1  
 RL: CAT (Catalyst use); USES (Uses)  
 (catalyst, for quinone regeneration in cyclic **hydrogen peroxide** prodn.)  
 IT 56854-76-3 64111-86-0  
 RL: USES (Uses)  
 (hydrogenation and oxidn. of, cyclic, for **hydrogen peroxide** prodn.)  
 IT 56854-77-4 99101-56-1  
 RL: USES (Uses)  
 (oxidn. and **hydrogenation** of, cyclic, for **hydrogen peroxide** prodn.)  
 IT 7722-84-1P, **Hydrogen peroxide**, preparation  
 RL: **PREP (Preparation)**  
 (prepn. of, improved cyclic **anthraquinone** process for)

L25 ANSWER 23 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN  
 ACCESSION NUMBER: 1987:461501 CAPLUS  
 DOCUMENT NUMBER: 107:61501  
 TITLE: Manufacture of H<sub>2</sub>O<sub>2</sub>  
 INVENTOR(S): Simon, Dietolf  
 PATENT ASSIGNEE(S): Peroxid-Chemie G.m.b.H., Fed. Rep. Ger.  
 SOURCE: Ger. Offen., 4 pp.  
 CODEN: GWXXBX  
 DOCUMENT TYPE: Patent  
 LANGUAGE: German  
 FAMILY ACC. NUM. COUNT: 1

KOROMA EIC1700

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
DE 3538816	A1	19870507	DE 1985-3538816	19851031
DE 3538816	C2	19961107		

PRIORITY APPLN. INFO.: DE 1985-3538816 19851031

AB A substituted **anthraquinone** and/or tetrahydroanthraquinone is dissolved in a water-immiscible org. solvent system in the presence of an aq. solns. of a **catalyst** consisting of an org. polymer coordinated with a precious or Pt-group metal; the **anthraquinone** is hydrogenated, the **catalyst** is removed, the **anthraquinone** in the org. phase is oxidized directly by an O-contg. gas to give H<sub>2</sub>O<sub>2</sub> and quinone residue, and the H<sub>2</sub>O<sub>2</sub> is removed by aq. extrn. and the quinones are rehydrated. A soln. of 5.0 times 10<sup>-2</sup> mol 2-amyltetrahydroanthraquinone in 200 mL diisobutylcarbinol-arom. compd. mixt. was hydrated with solns. of Pd-polymer coordination compds. With the carboxymethylcellulose and polyethylenimine **catalyst** solns. (pH 7 and 10.5, resp.), H<sub>2</sub> uptake was 161 and 610 L/0.4 g Pd-h, resp.

IT 84-65-1D, Anthraquinone, derivs.

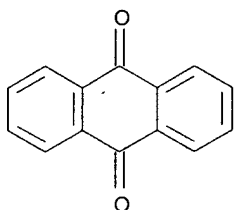
28758-94-3, Tetrahydroanthraquinone

RL: USES (Uses)

(catalytic hydrogenation and oxidn. of, in hydrogen peroxide manuf., metal-polymer coordinated catalysts for)

RN 84-65-1 CAPLUS

CN 9,10-Anthracenedione (9CI) (CA INDEX NAME)



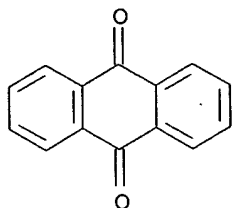
RN 28758-94-3 CAPLUS

CN 9,10-Anthracenedione, tetrahydro- (9CI) (CA INDEX NAME)

CM 1

CRN 84-65-1

CMF C14 H8 O2



IT 7722-84-1P, Hydrogen peroxide, preparation  
 RL: IMF (Industrial manufacture); PREP (Preparation)  
 (manuf. of, by hydrogenation and oxidn. of  
 anthraquinone derivs., metal-polymer coordinated  
 catalysts for)  
 RN 7722-84-1 CAPLUS  
 CN Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO-OH

IC ICM C01B015-023  
 ICS B01J031-28  
 CC 49-3 (Industrial Inorganic Chemicals)  
 ST polymer metal coordination compd catalyst; anthraquinone  
 deriv hydrogenation hydrogen peroxide;  
 catalytic hydrogenation oxidn hydrogen peroxide  
 IT Hydrogenation catalysts  
 (metal-polymer coordination compds., for hydrogen  
 peroxide manuf. from anthraquinone derivs.)  
 IT 84-65-1D, Anthraquinone, derivs.  
 28758-94-3, Tetrahydroanthraquinone 109634-59-5  
 RL: USES (Uses)  
 (catalytic hydrogenation and oxidn. of, in  
 hydrogen peroxide manuf., metal-polymer coordinated  
 catalysts for)  
 IT 7440-05-3D, Palladium, polymer complexes 7440-06-4D, Platinum, polymer  
 complexes 7440-15-5D, Rhenium, polymer complexes 7440-16-6D, Rhodium,  
 polymer complexes 7440-18-8D, Ruthenium, polymer complexes 9002-89-5D,  
 Poly(vinyl alcohol), palladium complexes 9002-98-6D, Polyethylenimine,  
 derivs., complexes 9003-39-8D, Poly(vinylpyrrolidone, palladium  
 complexes 9004-32-4D, Carboxymethylcellulose, palladium and rhodium  
 complexes 9005-82-7D, Amylose, palladium complexes 26336-38-9D,  
 Poly(vinylamine), acetic acid derivs., palladium complexes  
 RL: CAT (Catalyst use); USES (Uses)  
 (hydrogenation catalysts, for anthraquinone  
 derivs., in hydrogen peroxide manuf.)  
 IT 7722-84-1P, Hydrogen peroxide, preparation  
 RL: IMF (Industrial manufacture); PREP (Preparation)  
 (manuf. of, by hydrogenation and oxidn. of  
 anthraquinone derivs., metal-polymer coordinated

catalysts for)

L25 ANSWER 24 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1985:489834 CAPLUS

DOCUMENT NUMBER: 103:89834

TITLE: **Hydrogen peroxide**

INVENTOR(S): Filimonov, P. I.; Derbentsev, Yu. I.; Emel'yanov, E. M.; Petrova, N. A.; Gorbunov, A. I.; Burdin, V. V.; Boldenkov, N. I.; Kosareva, V. F.

PATENT ASSIGNEE(S): State Scientific-Research Institute of Chemistry and Technology of Heteroorganic Compounds, USSR

SOURCE: Fr. Demande, 20 pp.

CODEN: FRXXBL

DOCUMENT TYPE: Patent

LANGUAGE: French

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
FR 2548651	A1	19850111	FR 1983-11178	19830705
FR 2548651	B1	19861226		
IN 159350	A	19870509	IN 1983-DE388	19830608
			FR 1983-11178	19830705

PRIORITY APPLN. INFO.:

AB H2O2 is prep'd. by **catalytic** hydrogenation of a **mixt.** of **anthraquinone** and a solvent (pseudocumene or mesitylene in 2-octanol) to form anthrahydroquinone which is oxidized with O or O-contg. gas in the presence of a stabilizer (a 1-10% soln. of an inorg. acid) at pH 6.1-8.7. The resulting H2O2 is recovered with demineralized water by extn. Thus, a **mixt.** of 2-ethylanthraquinone, tetrahydro-2-ethylanthraquinone, and tetrahydroanthraquinone was dissolved in a **mixt.** of xylene and 2-octanol. The resulting soln. was hydrogenated at 50.degree. by using a Ni catalyst to give a anthrahydroquinone concn. of 0.446 mol/L. A 4% soln. of H3PO4 was added to adjust the pH to 6.8 and the resulting mixt. was oxidized with O at 50.degree. for 15 min. H2O2 was recovered with demineralized water by extn. The H2O2 yield was 98.55%.

IT 7722-84-1P, preparation

RL: IMF (Industrial manufacture); PREP (Preparation)  
(manuf. of, by anthraquinone process, pH control in)

RN 7722-84-1 CAPLUS

CN Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO-OH

IC ICM C01B015-023

CC 49-8 (Industrial Inorganic Chemicals)

ST **hydrogen peroxide** anthrahydroquinone oxidn; phosphoric acid stabilizer hydrogen peroxide

IT Oxidation

KOROMA EIC1700



(of anthrahydroquinones, pH control in, for reaction acceleration, in hydrogen peroxide manuf.)

IT 84-51-5 13936-21-5 28555-16-0

RL: RCT (Reactant); RACT (Reactant or reagent)  
(hydrogenation of, in hydrogen peroxide manuf.)

IT 7722-84-1P, preparation

RL: IMF (Industrial manufacture); PREP (Preparation)  
(manuf. of, by anthraquinone process, pH control in)

IT 97717-62-9 97717-63-0 97717-64-1

RL: RCT (Reactant); RACT (Reactant or reagent)  
(oxidn. of, pH control in, for reaction acceleration, in hydrogen peroxide manuf.)

IT 839-73-6

RL: RCT (Reactant); RACT (Reactant or reagent)  
(oxidn. of, pH control in, in hydrogen peroxide manuf.)

L25 ANSWER 25 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1985:206095 CAPLUS

DOCUMENT NUMBER: 102:206095

TITLE: **Hydrogen peroxide**

PATENT ASSIGNEE(S): State Scientific-Research Institute of Chemistry and Technology of Heteroorganic Compounds, USSR

SOURCE: Jpn. Kokai Tokkyo Koho, 9 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 60011208	A2	19850121	JP 1983-113671	19830625
PRIORITY APPLN. INFO.:			JP 1983-113671	19830625

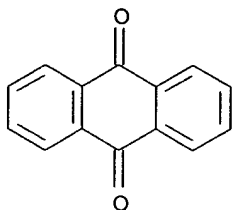
AB Org. solvents contg. anthraquinone are catalytically hydrogenated to form anthrahydroquinone, which is oxidized by O<sub>2</sub> in the presence of stabilizers at pH 6.1-8.7 to form anthraquinone and H<sub>2</sub>O<sub>2</sub>, the latter is extd. by deionized H<sub>2</sub>O, and the anthraquinone solns. are recycled to the hydrogenation. The yield of H<sub>2</sub>O<sub>2</sub> is increased and the explosion is prevented. Thus, a soln. contg. xylene, 2-octanol, 2-ethylanthraquinone, tetrahydro-2-ethylanthrahydroquinone, and tetrahydroanthraquinone was hydrogenated at 50.degree. with Ni catalyst, mixed with aq. H<sub>3</sub>PO<sub>4</sub> to pH 6.8, oxidized at 50.degree. by O<sub>2</sub>, and extd. by deionized H<sub>2</sub>O to obtain H<sub>2</sub>O<sub>2</sub>. The yield was 98.55%.

IT 84-65-1 28758-94-3

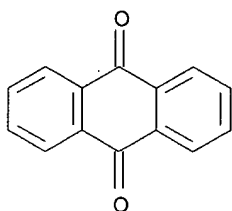
RL: RCT (Reactant); RACT (Reactant or reagent)  
(catalytic hydrogenation of, in hydrogen peroxide manuf.)

RN 84-65-1 CAPLUS

CN 9,10-Anthracenedione (9CI) (CA INDEX NAME)



RN 28758-94-3 CAPLUS  
 CN 9,10-Anthracenedione, tetrahydro- (9CI) (CA INDEX NAME)  
 CM 1  
 CRN 84-65-1  
 CMF C14 H8 O2



IT 7722-84-1P, preparation  
 RL: IMF (Industrial manufacture); PREP (Preparation)  
 (manuf. of, from anthraquinone, by catalytic  
 hydrogenation and oxidn.)  
 RN 7722-84-1 CAPLUS  
 CN Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO-OH

IC ICM C01B015-023  
 CC 49-8 (Industrial Inorganic Chemicals)  
 ST hydrogen peroxide manuf; anthraquinone  
 catalytic hydrogenation; anthrahydroquinone oxidn  
 IT 84-51-5 84-65-1 28555-16-0 28758-94-3  
 RL: RCT (Reactant); RACT (Reactant or reagent)  
 (catalytic hydrogenation of, in hydrogen  
 peroxide manuf.)  
 IT 7722-84-1P, preparation  
 RL: IMF (Industrial manufacture); PREP (Preparation)  
 (manuf. of, from anthraquinone, by catalytic  
 hydrogenation and oxidn.)

KOROMA EIC1700

IT 4981-66-2  
RL: RCT (Reactant); RACT (Reactant or reagent)  
(oxidn. of, by oxygen, for hydrogen peroxide  
manuf.)  
IT 7664-38-2, uses and miscellaneous  
RL: USES (Uses)  
(stabilizers, for hydrogen peroxide manuf., from  
anthraquinone by catalytic hydrogenation  
and oxidn.)

L25 ANSWER 26 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN  
ACCESSION NUMBER: 1985:26802 CAPLUS  
DOCUMENT NUMBER: 102:26802  
TITLE: Improvement of the synthetic process for  
tetrahydro-2-ethylanthraquinone  
AUTHOR(S): Huang, Zhiquan; Tian, Zhongyu  
CORPORATE SOURCE: Cent. China Inst. Technol., Wuhan, Peop. Rep. China  
SOURCE: Huaxue Shijie (1984), 25(7), 251-2  
CODEN: HUAKAB; ISSN: 0367-6358  
DOCUMENT TYPE: Journal  
LANGUAGE: Chinese

AB A batch process was studied for repacing the conventional circulation  
process in the title prepn. Distd. industrial ethanol [64-17-5] was used  
as a solvent for hydrogenation of 2-ethyl-9,10-anthracenediol [2026-28-0]  
in the presence of Raney Ni catalyst at 42 +- 1.degree.. The  
catalyst was used 3 times. After the oxidn. of  
tetrahydro-2-ethyl-9,10-anthracenediol [93913-90-7], the mother liquor  
contg. H2O2 was mixed with a waste catalyst, boiled,  
filtered, and distd. to recover EtOH.

IT 7722-84-1P, preparation  
RL: IMF (Industrial manufacture); PREP (Preparation)  
(prepn. of, in oxidn. of tetrahydroethylanthracenediol)

RN 7722-84-1 CAPLUS

CN Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO-OH

CC 45-4 (Industrial Organic Chemicals, Leather, Fats, and Waxes)  
Section cross-reference(s): 25

ST hydrogen peroxide manuf; hydrogenation  
ethylanthracenediol catalyst; hydroethylanthracenediol oxidn;  
anthraquinone tetrahydro ethyl prepn

IT Hydrogenation catalysts  
(Raney nickel, for ethylanthracenediol)

IT Oxidation  
(of tetrahydroethylanthracenediol)

IT 7440-02-0, uses and miscellaneous  
RL: CAT (Catalyst use); USES (Uses)  
(catalysts, for hydrogenation of  
ethylanthracenediol)

IT 2026-28-0

RL: RCT (Reactant); RACT (Reactant or reagent)  
(hydrogenation of, in presence of Raney nickel catalyst and ethanol)

IT 93913-90-7P

RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)  
(prepn. and oxidn. of)

IT 15547-17-8P

RL: IMF (Industrial manufacture); PREP (Preparation)  
(prepn. of)

IT 7722-84-1P, preparation

RL: IMF (Industrial manufacture); PREP (Preparation)  
(prepn. of, in oxidn. of tetrahydroethylanthracenediol)

IT 64-17-5, uses and miscellaneous

RL: USES (Uses)  
(solvent, for hydrogenation of ethylanthracenediol)

L25 ANSWER 27 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1983:5943 CAPLUS

DOCUMENT NUMBER: 98:5943

TITLE: Selectivity aspects of the hydrogenation stage of the anthraquinone process for hydrogen peroxide production

AUTHOR(S): Berglin, Thomas; Schoeoen, Nils Herman

CORPORATE SOURCE: Dep. Chem. React. Eng., Chalmers Univ., Goeteborg, S-412 96, Swed.

SOURCE: Industrial & Engineering Chemistry Process Design and Development (1983), 22(1), 150-3  
CODEN: IEPDAW; ISSN: 0019-7882

DOCUMENT TYPE: Journal

LANGUAGE: English

AB By measurement of the potential of a Raney Ni powder catalyst during competitive hydrogenation of 2-ethylanthraquinone (EAQ) and 2-ethyltetrahydroanthraquinone (THEAQ) in a xylene-EtOH mixed solvent, it was demonstrated that THEAQ was almost fully converted to its corresponding 2-ethyltetrahydroanthrahydroquinone (THEAHQ) before any 2-ethylanthrahydroquinone (EAHQ) was formed by hydrogenation of EAQ. The selectivity was attributed to a rapidly established internal homogeneous equil., EAHQ + THEAQ  $\rightleftharpoons$  EAQ + THEAHQ, which lies far to the right. The equil. const. (1.1 times 10<sup>5</sup> at 50.degree.) was detd. by measuring the std. redn. potentials of the resp. anthraquinone-anthrahydroquinone systems, EAQ-EAHQ and THEAQ-THEAHQ, in the protic solvent mixt. xylene-EtOH. The high value of the equil. const. was supported by spectrophotometric measurements in the nonprotic solvent system xylene-2-octanol, which is applicable to the industrial H<sub>2</sub>O<sub>2</sub> process. Also, the rate-detg. step in the hydrogenation of both the anthraquinones is within the H activation reaction sequence.

IT 7722-84-1P, preparation

RL: IMF (Industrial manufacture); PREP (Preparation)  
(manuf. of, ethylanthraquinone cyclic redn. and oxidn. in, selectivity in relation to)

RN 7722-84-1 CAPLUS  
CN Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO-OH

CC 49-8 (Industrial Inorganic Chemicals)  
ST ethylanthraquinone hydrogenation; ethylhydroanthraquinone hydrogenation;  
ethylhydroanthrahydroquinone hydrogenation; anthraquinone  
hydrogenation; hydroanthraquinone hydrogenation; hydrogen  
peroxide manuf.; hydrogenation anthraquinone  
IT Hydrogenation  
(of ethylanthraquinone, in hydrogen peroxide  
manuf., selectivity in relation to)  
IT 84-51-5  
RL: RCT (Reactant); RACT (Reactant or reagent)  
(hydrogenation of, in cyclic redn. and oxidn. for  
hydrogen peroxide, selectivity in relation to)  
IT 7722-84-1P, preparation  
RL: IMF (Industrial manufacture); PREP (Preparation)  
(manuf. of, ethylanthraquinone cyclic redn. and oxidn. in, selectivity  
in relation to)  
IT 839-73-6P  
RL: RCT (Reactant); SPN (Synthetic preparation); PREP  
(Preparation); RACT (Reactant or reagent)  
(prepn. and hydrogenation of, in cyclic redn. and oxidn. for  
hydrogen peroxide manuf., selectivity in relation to)  
IT 15547-17-8P  
RL: RCT (Reactant); SPN (Synthetic preparation); PREP  
(Preparation); RACT (Reactant or reagent)  
(prepn. and hydrogenation of, in cyclic redn. and oxidn. for  
hydrogen peroxide, selectivity in relation to)  
IT 68279-54-9P  
RL: PREP (Preparation)  
(prepn. of, in cyclic redn. and oxidn. for hydrogen  
peroxide, selectivity in relation to)

L25 ANSWER 28 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN  
ACCESSION NUMBER: 1982:457905 CAPLUS  
DOCUMENT NUMBER: 97:57905  
TITLE: Hydrogen peroxide  
INVENTOR(S): Goor, Gustaaf; Kunkel, Wolfgang  
PATENT ASSIGNEE(S): Degussa A.-G., Fed. Rep. Ger.  
SOURCE: Eur. Pat. Appl., 20 pp.  
CODEN: EPXXDW  
DOCUMENT TYPE: Patent  
LANGUAGE: German  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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KOROMA EIC1700

EP 44480	A1	19820127	EP 1981-105386	19810710
EP 44480	B1	19840411		
R: AT, BE, CH, DE, FR, GB, IT, NL, SE				
DE 3027253	A1	19820211	DE 1980-3027253	19800718
DE 3027253	C2	19821104		
IN 154788	A	19841215	IN 1981-CA684	19810625
ES 503800	A1	19821201	ES 1981-503800	19810709
AT 7011	E	19840415	AT 1981-105386	19810710
ZA 8104807	A	19820728	ZA 1981-4807	19810714
US 4349526	A	19820914	US 1981-283194	19810714
DD 202856	A5	19831005	DD 1981-231803	19810715
CA 1158418	A1	19831213	CA 1981-381918	19810716
JP 57056305	A2	19820403	JP 1981-110955	19810717
BR 8104597	A	19820406	BR 1981-4597	19810717
PL 127149	B1	19830930	PL 1981-232262	19810717
CA 1204749	A2	19860520	CA 1983-435928	19830901

## PRIORITY APPLN. INFO.:

DE 1980-3027253	19800718
EP 1981-105386	19810710
CA 1981-381918	19810716

AB Tetra-substituted ureas, preferably N,N-diisopropyl-N1-methyl-N1-phenylurea (I) and N,N-dibutyl-N1-methyl-N1-phenylurea are used as oxidn.-resistant solvents for anthraquinones and anthrahydroquinones in the prepn. of H2O2 by the catalytic hydrogenation of an alkylated anthraquinone to an anthrahydroquinone, oxidn. of the latter, and extn. of H2O2 from the reaction mixt. with H2O. Thus, a mixt. contg. tetrabutylbenzene 70 and I 30 vol. parts was used as a solvent for 2-ethylanthraquinone (II) and 2-ethyltetrahydroanthraquinone (III) to obtain a soln. contg. 150 g(II + III)/L at II-III = 1:1. The soln. was hydrogenated at 50.degree. in the presence of a fixed-bed catalyst and subsequently oxidized by an O-contg. gas. The H2O2 content in the final soln. was 14.6 g/L.

IT 7722-84-1P, preparation

RL: PREP (Preparation)

(prepn. of, from alkylated anthraquinone, by catalytic hydrogenation)

RN 7722-84-1 CAPLUS

CN Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO-OH

IC C01B015-023; C07C127-19

CC 49-8 (Industrial Inorganic Chemicals)

ST hydrogen peroxide prepn anthraquinone; urea solvent hydrogen peroxide prepn; anthraquinone hydrogenation oxidn hydrogen peroxide

IT Hydrogenation

(catalytic, of alkylated anthraquinone, in hydrogen peroxide prepn.)

IT 82504-15-2 82504-16-3  
RL: USES (Uses)  
(as solvent for anthraquinone and anthrahydroquinone, in hydrogen peroxide prepn.)  
IT 84-51-5  
RL: RCT (Reactant); RACT (Reactant or reagent)  
(catalytic hydrogenation of, for hydrogen peroxide prepn.)  
IT 28555-16-0  
RL: RCT (Reactant); RACT (Reactant or reagent)  
(oxidn. of, for hydrogen peroxide prepn.)  
IT 7722-84-1P, preparation  
RL: PREP (Preparation)  
(prepn. of, from alkylated anthraquinone, by catalytic hydrogenation)

L25 ANSWER 29 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1981:499810 CAPLUS

DOCUMENT NUMBER: 95:99810

TITLE: Kinetic and mass transfer aspects of the hydrogenation stage of the anthraquinone process for hydrogen peroxide production

AUTHOR(S): Berglin, Thomas; Schoeoen, Nils Herman

CORPORATE SOURCE: Dep. Chem. React. Eng., Chalmers Univ. Technol., Goeteborg, S-412 96, Swed.

SOURCE: Industrial & Engineering Chemistry Process Design and Development (1981), 20(4), 615-21  
CODEN: IEPDAW; ISSN: 0019-7882

DOCUMENT TYPE: Journal

LANGUAGE: English

AB The hydrogenation of 2-ethylanthraquinone (EAQ) and 2-ethyltetrahydroanthraquinone (THEAQ) was carried out in a slurry reactor in a 1:1 xylene-2-octanol solvent with a com. size dispersed Raney Ni catalyst. The hydrogenation is 1st order with respect to H and zero order with respect to anthraquinone. Accounting for mass-transport resistances, the activation energies are 34.4 +/- 1.7 kJ/mol and 41.3 +/- 10.7 kJ/mol for EAQ and THEAQ, resp. In the hydrogenation of mixts. of EAQ and THEAQ, THEAQ reacts in preference to EAQ and with a rate that is dependent on the EAQ concn. Mass-transport resistances, esp. in the catalyst pores, play a significant role.

IT 7722-84-1P, preparation  
RL: PREP (Preparation)  
(manuf. of, hydrogenation of anthraquinone derivs. in, kinetics of and mass transfer in)

RN 7722-84-1 CAPLUS

CN Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO- OH

KOROMA EIC1700

CC 48-5 (Unit Operations and Processes)  
 Section cross-reference(s): 49  
 ST hydrogenation anthraquinone deriv kinetics;  
 hydrogen peroxide manuf hydrogenation; mass transfer  
 hydrogenation anthraquinone  
 IT Mass transfer  
 (in hydrogenation, of anthraquinone derivs  
 . in hydrogen peroxide manuf.)  
 IT Kinetics of hydrogenation  
 (of anthraquinone derivs., in hydrogen  
 peroxide manuf.)  
 IT Hydrogenation  
 (of anthraquinone derivs., in hydrogen  
 peroxide manuf., mass transfer in)  
 IT 84-51-5 28555-16-0  
 RL: RCT (Reactant); RACT (Reactant or reagent)  
 (hydrogenation of, in hydrogen peroxide  
 manuf., kinetics of and mass transfer in)  
 IT 7722-84-1P, preparation  
 RL: PREP (Preparation)  
 (manuf. of, hydrogenation of anthraquinone  
 derivs. in, kinetics of and mass transfer in)

L25 ANSWER 30 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1976:526755 CAPLUS

DOCUMENT NUMBER: 85:126755

TITLE: Hydrogen peroxide by the  
 anthraquinone process

INVENTOR(S): Franchuk, V. I.; Ovchinnikova, L. I.; Kosareva, V. F.

PATENT ASSIGNEE(S): USSR

SOURCE: Ger., 3 pp.

CODEN: GWXXAW

DOCUMENT TYPE: Patent

LANGUAGE: German

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
DE 1667515	A	19710616	DE 1968-F54579	19680118
DE 1667515	B2	19751120		
DE 1667515	C3	19760930		

PRIORITY APPLN. INFO.: DE 1968-F54579 19680118

AB A mixt. of 2-isoamylanthraquinone and tetrahydro-2-  
 isoamylanthraquinone in an org. solvent is hydrogenated in the presence of  
 a Ni catalyst heated previously to 120-160.degree. in an alkali  
 medium. With 200-300 g tetrahydro-2-isoamylanthraquinone/l. the degree of  
 hydrogenation of the 2-isoamylanthraquinone is 55-60%. After removal of  
 the Ni catalyst, oxidn. of the hydrogenated  
~~isoamylanthraquinone, and extn. of the oxidized product with water an aq~~  
~~soln. contg. 30-44 g H2O2/l. is obtained. Thus, a solvent of equal vols.~~  
~~of tert-butyltoluene and 2-octanol contg. 2-isoamylanthraquinone 250 and~~



tetrahydro-2-isoamylanthraquinone 250 g/l. was hydrogenated at 60-65.degree. in the presence of a Ni catalyst treated previously at 120-160.degree. for 1-3 hr in 20-5% aq. NaOH with 25.4 l. H/l. The Ni catalyst was removed and the soln. treated O or an O-contg. gas and then the H2O2 extd. with water. The product was an aq. soln. contg. 38.6 g H2O2/l.

IT 7722-84-1P, preparation

RL: PREP (Preparation)

(nickel catalyst activation for, from 2-isoamylanthraquinone and tetrahydro-2-isoamylanthraquinone)

RN 7722-84-1 CAPLUS

CN Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO-OH

IC C01B

CC 49-8 (Industrial Inorganic Chemicals)

ST hydrogen peroxide; nickel catalyst regeneration

IT Hydrogenation catalysts

(nickel, for 2-isoamylanthraquinone, in hydrogen peroxide manuf.)

IT 60544-73-2

RL: USES (Uses)

(2-isoamylanthraquinone hydrogenation in presence of, in hydrogen peroxide manuf., nickel catalyst activation for)

IT 7440-02-0, uses and miscellaneous

RL: CAT (Catalyst use); USES (Uses)

(catalyst, activation of, for hydrogenation of 2-isoamylanthraquinone in hydrogen peroxide manuf.)

IT 24646-67-1

RL: RCT (Reactant); RACT (Reactant or reagent)

(hydrogenation of, in hydrogen peroxide manuf., nickel catalyst activation for)

IT 7722-84-1P, preparation

RL: PREP (Preparation)

(nickel catalyst activation for, from 2-isoamylanthraquinone and tetrahydro-2-isoamylanthraquinone)

L25 ANSWER 31 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1974:527349 CAPLUS

DOCUMENT NUMBER: 81:127349

TITLE: Highly selective palladium catalyst for the hydrogenation of anthraquinones in the production of hydrogen peroxide

INVENTOR(S): Matsumura, Shiro; Shin, Hiroshi; Sugano, Junichiro; Iwamoto, Yoshiro; Yoshii, Tadashi; Kuriyama, Ikuhisa

PATENT ASSIGNEE(S): Mitsubishi Gas Chemical Co., Inc.

SOURCE: Jpn. Tokkyo Koho, 4 pp.

CODEN: JAXXAD

DOCUMENT TYPE: Patent  
 LANGUAGE: Japanese  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 49005120	B4	19740205	JP 1969-78546	19691003

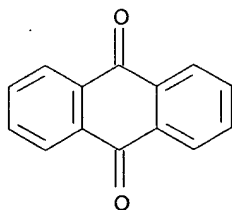
PRIORITY APPLN. INFO.: JP 1969-78546 19691003

AB A mixt. of a Pd compd. and a compd. of Cu or Ag is reduced by using an alk. aq. HCHO soln. to give a highly selective Pd-based hydrogenation catalyst used for a H2O2-manufg. process, which consists of hydrogenation of anthraquinone derivs. and subsequent oxidn. of the resultant anthrahydroquinone. The selectivity of the catalyst can be increased by heating the catalyst in H or a H-contg. gas mixt. The catalyst suppresses the formation of byproducts such as tetrahydroanthraquinones and hydroxyanthrones during the hydrogenation. Thus, 10 g of aq. Cu(NO3)2 soln. (1% Cu) was added to 100 g Al2O3 dispersed in 150 ml H2O, the mixt. was heated, the pH was adjusted to 10, and the Al2O3 was filtered, dried at 80.degree., and calcined at 400.degree. for 2 hr to give Cu-impregnated Al2O3. This product was dispersed in 150 ml H2O; then 50 g of aq. Na2PdCl4 soln. (2% Pd) was added, and the pH was adjusted to 10 +/- 0.5. The dispersion was then heat to 60.degree., HCHO (3 ml) was added, and the impregnated Al2O3 was then filtered, washed, and dried at 80.degree. to give a supported Pd-Cu catalyst.

IT 84-65-1  
 RL: RCT (Reactant); RACT (Reactant or reagent)  
 (hydrogenation of, in hydrogen peroxide  
 manuf., catalysts for)

RN 84-65-1 CAPLUS

CN 9,10-Anthracenedione (9CI) (CA INDEX NAME)



IT 7722-84-1P, preparation  
 RL: PREP (Preparation)  
 (manuf. of, catalyst for hydrogenation of  
 anthraquinones in)

RN 7722-84-1 CAPLUS

CN Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO-OH

IC B01J; C01B; C07C  
 CC 67-1 (Catalysis and Reaction Kinetics)  
 Section cross-reference(s): 49  
 ST copper palladium hydrogenation catalyst; anthraquinone  
 hydrogenation palladium catalyst; hydrogen  
 peroxide manufg  
 IT Hydrogenation catalysts  
 (palladium-transition metal-aluminum oxide, for anthraquinones  
 in hydrogen peroxide manuf.)  
 IT 7440-05-3, uses and miscellaneous  
 RL: CAT (Catalyst use); USES (Uses)  
 (catalyst, for hydrogenation of  
 anthraquinone in hydrogen peroxide manuf.)  
 IT 7440-22-4, uses and miscellaneous 7440-50-8, uses and miscellaneous  
 RL: CAT (Catalyst use); USES (Uses)  
 (catalysts, contg. palladium for hydrogenation of  
 anthraquinones in hydrogen peroxide manuf.)  
 IT 84-65-1  
 RL: RCT (Reactant); RACT (Reactant or reagent)  
 (hydrogenation of, in hydrogen peroxide  
 manuf., catalysts for)  
 IT 7722-84-1P, preparation  
 RL: PREP (Preparation)  
 (manuf. of, catalyst for hydrogenation of  
 anthraquinones in)  
 IT 50-00-0, reactions  
 RL: RCT (Reactant); RACT (Reactant or reagent)  
 (redn. by, of metal salts in catalyst manuf.)

L25 ANSWER 32 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN  
 ACCESSION NUMBER: 1973:86680 CAPLUS  
 DOCUMENT NUMBER: 78:86680  
 TITLE: Hydrogen peroxide  
 INVENTOR(S): Denaeyer, Jose Luis; Jones, Robert  
 PATENT ASSIGNEE(S): Solvay et Cie.  
 SOURCE: Ger. Offen., 10 pp.  
 CODEN: GWXXBX  
 DOCUMENT TYPE: Patent  
 LANGUAGE: German  
 FAMILY ACC. NUM. COUNT: 2  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
DE 2228949	A1	19730118	DE 1972-2228949	19720614
DE 2228949	B2	19801127		
DE 2228949	C3	19810903		
BE 769675	A1	19720110	BE 1971-105625	19710708
PRIORITY APPLN. INFO.:			BE 1971-105625	19710708

AB H2O2 was manufd. in a cyclic process of hydrogenating at >90% yield a mixt. of 2-tert-amyltetrahydroanthraquinone (I) with 2-sec-isoamyltetrahydroanthraquinone (II) on a Ni or Pd catalyst, oxidn. with air, extn. of the H2O2 formed with H2O, and recycling the tetrahydroanthraquinones. Thus, a mixt. contg. I 40 and II 60% 159, C9-hydrocarbon petroleum fraction 364, and diisobutylcarbinol 477 g/kg of the soln. was hydrogenated in a 90% yield over a Ni catalyst at 65.degree. and oxidized by an air flow to give 17.48 g H2O2/kg soln. Regeneration of the soln. after 300 hr operating time with aq. NaOH with exclusion of air at 45.degree. gave enrichment to 178 g of a I-II mixt./kg of the soln.

IT 7722-84-1P, preparation  
RL: PREP (Preparation)  
(amyltetrahydroanthraquinone intermediates in continuous)

RN 7722-84-1 CAPLUS

CN Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO-OH

IC C01B

CC 49-8 (Industrial Inorganic Chemicals)

ST hydrogen peroxide anthraquinone process

IT Hydrogenation catalysts  
(nickel, for hydrogen peroxide)

IT 7722-84-1P, preparation  
RL: PREP (Preparation)  
(amyltetrahydroanthraquinone intermediates in continuous)

IT 7440-02-0, uses and miscellaneous  
RL: CAT (Catalyst use); USES (Uses)  
(catalysts, for hydrogenation)

IT 38650-61-2 38650-62-3  
RL: USES (Uses)  
(in manuf., of hydrogen peroxide)

L25 ANSWER 33 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1972:556953 CAPLUS

DOCUMENT NUMBER: 77:156953

TITLE: Regeneration of hydrogenation catalysts

INVENTOR(S): Jenny, Theodore Manchester; Porter, Donald Herbert; Zudroziewski, Eugene Michael

PATENT ASSIGNEE(S): FMC Corp.; Tokai Electro-Chemical Co., Ltd.

SOURCE: Jpn. Tokkyo Koho, 7 pp.  
CODEN: JAXXAD

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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JP 47007527 B4 19720303 JP 1962-9267 19620314  
 AB A mixt. of dimethylantraquinone in quinone and trioctyl phosphate in hydroquinone with H were passed cyclically over Pd(0.3%) on Al2O3 to form dimethylhydro-quinone, and the hydrogenated mixt. was transferred continuously to an oxidn. chamber with air to prep. H2O2. When H2O2 formation ceased, the hydrogenation process was interrupted and the catalyst was treated with steam for 16 hr. The activity and selectivity were recovered and the catalyst was applicable to hydrogenation and oxidn.  
 IT 7722-84-1P, preparation  
 RL: PREP (Preparation)  
 (from anthraquinone derivs., regeneration of palladium hydrogenation catalysts for)  
 RN 7722-84-1 CAPLUS  
 CN Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO-OH

IC B01J; C01B  
 CC 67-1 (Catalysis and Reaction Kinetics)  
 ST hydrogenation oxidn palladium catalyst  
 IT Hydrogenation catalysts  
 (palladium, regeneration of, with use in hydrogen peroxide manuf.)  
 IT 7440-05-3P, uses and miscellaneous  
 RL: CAT (Catalyst use); PREP (Preparation); USES (Uses)  
 (catalysts, regeneration of, with use in hydrogenation in manuf. of hydrogen peroxide)  
 IT 7722-84-1P, preparation  
 RL: PREP (Preparation)  
 (from anthraquinone derivs., regeneration of palladium hydrogenation catalysts for)

L25 ANSWER 34 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1971:143793 CAPLUS

DOCUMENT NUMBER: 74:143793

TITLE: Development and study of a model of a reactor used for the liquid-phase hydrogenation of a mixture of anthraquinones

AUTHOR(S): Kirdin, K. K.; Balabin, I. E.

CORPORATE SOURCE: USSR

SOURCE: Khimicheskaya Promyshlennost (Moscow, Russian Federation) (1971), 47(2), 83-8  
 CODEN: KPRMAW; ISSN: 0023-110X

DOCUMENT TYPE: Journal

LANGUAGE: Russian

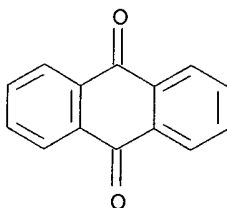
AB A math. model for the hydrogenation of anthraquinone mixts. (in the production of H2O2) was derived and used to det. the optimum process parameters, which were found to be as follows: degree

of conversion of the H<sub>2</sub> 0.9, catalyst concn. 2-4%, overall mass-transfer coeff. 60 min<sup>-1</sup>, gas content of the system <0.25. A large-scale plant based on the model would have an output of 6250 tons of 30% H<sub>2</sub>O<sub>2</sub> per year (per m<sup>3</sup> of working space), as compared with 833 tons in existing equipment.

IT 7722-84-1P, preparation  
 RL: PREP (Preparation)  
 (from anthraquinone, by liq.-phase hydrogenation, optimization of)  
 RN 7722-84-1 CAPLUS  
 CN Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) (9CI) (CA INDEX NAME)

HO-OH

IT 84-65-1  
 RL: RCT (Reactant); RACT (Reactant or reagent)  
 (hydrogenation of, liq.-phase, optimization of)  
 RN 84-65-1 CAPLUS  
 CN 9,10-Anthracenedione (9CI) (CA INDEX NAME)



CC 48 (Unit Operations and Processes)  
 ST model reactor hydrogenation anthraquinone; hydrogen peroxide prepn hydrogenation anthraquinone  
 IT Optimization  
 (in hydrogen peroxide manuf., from anthraquinone by hydrogenation)  
 IT Hydrogenation  
 (of anthraquinone, liq.-phase, optimization of)  
 IT 7722-84-1P, preparation  
 RL: PREP (Preparation)  
 (from anthraquinone, by liq.-phase hydrogenation, optimization of)  
 IT 84-65-1  
 RL: RCT (Reactant); RACT (Reactant or reagent)  
 (hydrogenation of, liq.-phase, optimization of)

L25 ANSWER 35 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN  
 ACCESSION NUMBER: 1971:91745 CAPLUS  
 DOCUMENT NUMBER: 74:91745  
 TITLE: Hydrogenation catalyst for the manufacture

## of hydrogen peroxide

INVENTOR(S): Keith, Carl D.; Cornely, Kurt W.; Lee, Nathan Dean  
 PATENT ASSIGNEE(S): Engelhard Minerals and Chemicals Corp.  
 SOURCE: Ger. Offen., 29 pp.  
 CODEN: GWXXBX  
 DOCUMENT TYPE: Patent  
 LANGUAGE: German  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
DE 2029394	A	19710114	DE 1970-2029394	19700615
DE 2029394	B2	19740502		
DE 2029394	C3	19741205		
US 3635841	A	19720118	US 1969-833678	19690616
NL 7008676	A	19701218	NL 1970-8676	19700612
FR 2052509	A5	19710409	FR 1970-21731	19700612
BE 752008	A	19701116	BE 1970-752008	19700615
GB 1267794	A	19720322	GB 1970-1267794	19700615
SE 349482	B	19721002	SE 1970-8297	19700615
CH 537751	A	19730731	CH 1970-9015	19700615
AT 309386	B	19730810	AT 1970-5363	19700615
ES 380805	A1	19730401	ES 1970-380805	19700616
JP 50004359	B4	19750218	JP 1970-51665	19700616
			US 1969-833678	19690616

## PRIORITY APPLN. INFO.:

AB A Pd-Al<sub>2</sub>O<sub>3</sub> catalyst is prep'd. for the hydrogenation of anthraquinones to give H<sub>2</sub>O<sub>2</sub>. Thus, 25 g powd. Al of 5-50 .mu.m particle size and 0.095 mole HCO<sub>2</sub>H are added in portions to 500 ml deionized H<sub>2</sub>O to give a 34:66% amorphous alumina-boehmite (19 .ANG. particle size) slurry. Calcined .gamma.-Al<sub>2</sub>O<sub>3</sub> (40% with respect to the total Al<sub>2</sub>O<sub>3</sub>) of 1.8-22 .mu. m particle size is added to the slurry. This slurry is injected into 77:23 vol. % mineral oil-CCl<sub>4</sub> mixt. satd. with NH<sub>3</sub> for coagulation to give 10 mesh spherules which after calcinati on for 4 hr at 950.degree. give .theta.- and .delta.-Al<sub>2</sub>O<sub>3</sub> of 90 m<sup>2</sup>/g sp. surface area. The spherules are coated with Pd (0.3%) by heating in Na chloropalladate soln. and activated with formalin. Hydrogenation of 10% 2-ethylantraquinone in aromatic solvents over the above catalyst at 45-55.degree. and 2.1 atm gage H gives 12.1 kg H<sub>2</sub>O<sub>2</sub>/day/kg ca talyst.

IT 7722-84-1P, preparation

RL: SPN (Synthetic preparation); **PREP (Preparation)**  
 (by hydrogenation of ethylantraquinone, **catalysts**  
 for)

RN 7722-84-1 CAPLUS

CN Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) (9CI) (CA INDEX NAME)

HO-OH

IC B01J; B01B

KOROMA EIC1700

CC 67 (Catalysis and Reaction Kinetics)  
 ST hydrogen peroxide catalyst; peroxide  
 hydrogen catalyst; palladium catalyst  
 hydrogen peroxide  
 IT Hydrogenation catalysts  
 (palladium-boehmite-aluminum oxide, for ethylanthraquinone in manuf. of  
 hydrogen peroxide)  
 IT 7722-84-1P, preparation  
 RL: SPN (Synthetic preparation); PREP (Preparation)  
 (by hydrogenation of ethylanthraquinone, catalysts  
 for)  
 IT 1318-23-6  
 RL: CAT (Catalyst use); USES (Uses)  
 (catalyst supports, for palladium catalysts)  
 IT 7440-05-3, uses and miscellaneous  
 RL: CAT (Catalyst use); USES (Uses)  
 (catalysts, for hydrogenation of ethylanthraquinone  
 in manuf. of hydrogen peroxide)  
 IT 1344-28-1, uses and miscellaneous  
 RL: CAT (Catalyst use); USES (Uses)  
 (catalysts, with palladium, for ethylanthraquinone  
 hydrogenation in hydrogen peroxide manuf.)  
 IT 84-51-5  
 RL: RCT (Reactant); RACT (Reactant or reagent)  
 (hydrogenation of, catalysts for hydrogen  
 peroxide manuf. by)

L25 ANSWER 36 OF 36 CAPLUS COPYRIGHT 2003 ACS on STN  
 ACCESSION NUMBER: 1969:61616 CAPLUS  
 DOCUMENT NUMBER: 70:61616  
 TITLE: Catalyst for hydrogen  
 peroxide production  
 PATENT ASSIGNEE(S): Deutsche Gold- und Silber-Scheideanstalt vorm.  
 Roessler  
 SOURCE: Fr., 4 pp.  
 CODEN: FRXXAK  
 DOCUMENT TYPE: Patent  
 LANGUAGE: French  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
FR 1509429		19680112		
PRIORITY APPLN. INFO.:		DE	19660222	
		DE	19670111	

AB Catalysts consisting of a mixt. of Pd with up to 50%  
 of other Group VIII elements have a higher activity and selectivity than  
 pure Pd in the hydrogenation step of the anthraquinone method.  
 The constituents of the catalyst must be intimately,  
 mixed, which is achieved by copptn. from a soln. contg. the other  
 metals, esp. Ir and Ni. By an appropriate choice of the compn. of the



contact material, both its activity and selectivity can be influenced. For example, 5 g. 2-ethylanthraquinone dissolved in 100 ml. of a 3:1 mixt. of an aromatized gasoline and trioctyl phosphate was hydrogenated in the presence of 50 mg. contact material at 35.degree.. When the latter consisted of Pd 100; Pd 77 and Ir 23; and Pd 95 and Pt 5%; the ration of the main reaction (formation of anthrahydroquinone) to the secondary reaction (formation of tetrahydroanthraquinone) was 320, 640, and 510:1, resp. with approx. equal activity. Addns. of 1-10% Ru were equally effective for the selectivity of the contact as addns. of Ir. In another example, catalysts on a support contg. 2% Pt on activated Al<sub>2</sub>O<sub>3</sub> having a particle size of 0.6 mm., were used. The hydrogenation, carried out as in the 1st example but with 3 g. support catalyst, resulted for a compn. of 100% Pd and 70% Pd with 30% Ir in a H admission activity in the main reaction of 80 and 106 ml./min, and a ratio as above of 300 and 300:1, resp.

IT 7722-84-1P, preparation

RL: PREP (Preparation)

(hydrogenation catalysts for, platinum metals as)

RN 7722-84-1 CAPLUS

CN Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) (9CI) (CA INDEX NAME)

HO-OH

IC C01B

CC 67 (Catalysis and Reaction Kinetics)

ST **hydrogen peroxide** prodn; peroxides H prodn; platinum catalysts

IT Platinum metals

RL: CAT (Catalyst use); USES (Uses)

(catalysts, for hydrogenation in hydrogen peroxide manuf. by autoxidn.)

IT **Hydrogenation catalysts**

(platinum metals, for hydrogen peroxide manuf. by autoxidn.)

IT 7440-02-0, uses and miscellaneous 7440-06-4, uses and miscellaneous  
7440-16-6, uses and miscellaneous 7440-18-8, uses and miscellaneous

RL: CAT (Catalyst use); USES (Uses)

(catalysts from palladium and, for hydrogenation in hydrogen peroxide manuf. by autoxidn.)

IT 7440-05-3, uses and miscellaneous

RL: CAT (Catalyst use); USES (Uses)

(catalysts from platinum metals and, for hydrogenation in hydrogen peroxide manuf. by autoxidn.)

IT 7722-84-1P, preparation

RL: PREP (Preparation)

(hydrogenation catalysts for, platinum metals as)